

COOBOOL CREEK :
A PREHISTORIC AUSTRALIAN HOMINID POPULATION

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This work is a thesis submitted for
the Degree of Doctor of Philosophy in
the Australian National University.

May 1982

EXCEPT WHERE STATED IN THE ACKNOWLEDGEMENTS
AND THE TEXT, THIS THESIS IS THE PRODUCT OF MY
OWN RESEARCH.

PETER BROWN
PREHISTORY
A. N. U.

THIS THESIS WOULD HAVE TAKEN A CONSIDERABLY
GREATER TIME TO COMPLETE HAD IT NOT BEEN FOR
THE CONTINUAL HELP AND SUPPORT OF MY WIFE,
FIONA WOOD. THIS IS FOR HER.

ABSTRACT

Morphological, univariate and multivariate comparisons of the crania, mandibles and dentitions from Coobool Creek place them within the Kow Swamp range of variation and distinguish them from other prehistoric and recent Australian populations.

The Coobool Creek crania are distinguished from 'recent' Murray Valley crania by a matrix of morphological and metrical features which reflect the combination of an archaic morphological pattern with the effects of a specific cultural practice, artificial cranial deformation. Analyses of the Coobool Creek orofacial skeletons support earlier work with the Kow Swamp series in indicating a temporal trend towards structural reduction in the central Murray River Valley over the last 10,000 years.

A similar temporal trend towards size reduction is also present in the mandibles and dentitions from this region. On the available evidence there appears to have been a fairly rapid reduction in the size of the masticatory complex during the period 10,000 to 6,000 years BP followed by apparent stability. There is little evidence for a causal relationship between the temporal changes in the masticatory system and culture for the Murray River Valley during this period.

Morphological and metrical features of the Coobool Creek crania, mandibles and dentitions support the argument for a regional morphological continuum with the Indonesian *Homo erectus* material.

ACKNOWLEDGEMENTS

Although this thesis represents my own work, its completion was only made possible through the assistance, criticism and interest of a number of individuals and institutions.

Foremost among these I thank the Department of Prehistory, Research School of Pacific Studies, the Australian National University. My association with this Department predates the commencement of this thesis by several years. As an undergraduate this Department simultaneously stimulated my intellect and bank account by employing me as a laboratory technician. If there was a turning point in my life it was the offer of this employment by Jim Allen in January 1976.

Alan Thorne introduced me to the practise of paleoanthropology and taught me the delicate art of the *sate* stick. Later as my supervisor, Alan provided me with the necessary freedom in which to undertake my research and while not always agreeing with my views always supported my right to state them. My debt to Alan is great.

What can you say about Jack Golson, editor extraordinaire. Jack as my other supervisor went through my drafts with a fine comb converting my pidgin into English. To my knowledge nothing enters Jack's office that does not leave improved.

Other members of the Prehistory Department who have influenced this thesis either by direct help or conversation are Jane Balme, John Burton, Klim Gollan, Colin Pardoe, Les Togl, Philip Hughes, Stella Wilkie, Jim Allen and Jeanette Hope.

Special mention must be made of Jill Johnston whose work on my behalf, as Departmental secretary, never ceased.

In the last minute dash to complete this work John Burton wrote the computer program to tart up my reference list.

Winifred Mumford premier draftsman, who drew the three maps for this thesis, was a source of both advice and materials when in need. Dragi Markovic whose photographic talents have bailed out many a thesis took the photographs in Plates 1 to 32.

People with whom I have discussed aspects of this thesis and from whose thoughts I have benefited are Tasman Brown, Colin Groves, Len Freedman, Stephen Molnar, Lindsay Richards, Patricia Smith, Peter White, Milford Wolpoff and Richard Wright.

Fiona Wood helped at all stages in the production of this thesis, prompting tardy computers, proofreading and typing drafts and final texts. That I have managed to survive the last three years virtually unscathed is in no small part due to her support.

Illustration: With the exception of the three maps drawn by Winifred Mumford I drew all the illustrations in this thesis.

Typing: This was a cooperative effort. Elizabeth Campbell typed the text and I am indebted to her for the excellence of her work. The tables, figures and references were typed by Fiona Wood, Elizabeth Campbell and myself.

Materials: This thesis would not have been possible without the access to materials granted by the following individuals and institutions. I thank them all.

Professor L.J. Ray, Department of Anatomy, University of Melbourne.

Professor T. Brown, Department of Restorative Dentistry, University of Adelaide.

Mr. G. Pretty, Senior Curator of Anthropology, South Australian Museum.

Dr. L. Richards, Department of Restorative Dentistry, University of Adelaide.

Dr. L. Satterthwaite, former Curator in Anthropology, South Australian Museum.

Dr. W. Wood, Department of Anatomy, University of Queensland.

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INTRODUCTION

This project was inspired by the discovery and subsequent analysis of the terminal Pleistocene skeletal series from Kow Swamp in the central Murray River Valley (Thorne and Macumber, 1972; Thorne, 1975; Thorne, 1976; Thorne and Wilson, 1977; Thorne and Wolpoff, 1981). In particular it was the statement that the Kow Swamp morphological pattern provided 'strong evidence that major morphological changes have occurred in the facial and frontal regions of Aboriginal crania from northern Victoria over the last 9-10,000 years' (Thorne and Wilson, 1977:399) which provided the impetus.

At the time of the initial reconstruction and analysis of the Kow Swamp crania (Thorne, 1975) there was little skeletal material from controlled archaeological excavation available for comparative purposes. Excavations at Roonka (Pretty, 1977; Prokopec, 1979) and Broadbeach (Haglund, 1976; Freedman and Wood, 1977) were in progress but the reconstruction and analysis of the human skeletal materials were not complete.

This project, as originally conceived, intended to examine the issue of temporal change in the size and morphology of the orofacial skeleton in the Murray River Valley, using the added chronological controls provided by the Roonka and Broadbeach series. If a firm temporal trend was present, the question was then whether this was the result of internal biological processes of selection and adaptation resulting from cultural and environmental change or a simple reflection of gene flow from populations exhibiting differing morphological patterns outside of the Murray Valley region.

Evidence for morphological change and structural reduction in the orofacial skeleton and dentition during the last 10,000 to 20,000 years is present for Africa (Rightmire, 1966; Carlson and Van Gervan, 1977), Europe (Brace, 1967; Brace and Mahler, 1971; Brose and Wolpoff, 1971) and Asia (Brace, 1978). Although there is some debate over whether this reflects evolution or migration (Howells, 1978), the general argument is for a causal relationship between the technological changes of the Paleolithic and Neolithic and the structural reduction of the orofacial skeleton. In particular, it is said that the increasing pre-masticatory preparation of food and the decreasing use of the teeth as tools resulted in a relaxation in the selection pressure for a large, robust and prognathic facial skeleton and large, thick-enamelled teeth (Brace, 1963; Brace and Mahler, 1971; Brose and Wolpoff, 1971). There has been considerable debate over the genetic mechanisms involved (Brace, 1963, 1964; Wright, 1964; Prout, 1964; Soafer, 1973; Suarez, 1974). Despite this there appears to be a general consensus that the observable changes in the masticatory complex were initiated by technological advancement.

In the Australian context, the question would be whether there was a similar correlation between changes in the masticatory complex and culture. Emphasis was to be placed on the relationships between tooth size, the size and morphology of the facial skeleton and tooth wear. Initial problems arose from the sampling difficulties resulting from the poor preservation of human skeletal materials in the three major Australian sites, Kow Swamp, Roonka and Broadbeach.

In September 1980, in the concluding stage of what was intended to be the final data-collecting trip for my thesis, I was working on the Murray Black collection of the Department of Anatomy of Melbourne University,

when I noticed a series of heavily carbonate-encrusted and mineralised crania. The crania combined large and robust facial skeletons with a marked recession of the frontal squama. My brief initial comparison suggested that this material fell within the range of variation exhibited by the Kow Swamp series. Subsequently I was informed by Professor L.J. Ray that this material had been collected by the late Murray Black from Coobool Creek, an area 60 kilometers north-west of Kow Swamp.

Realising the importance of the Coobool Creek material, I asked for permission to transport the series to Canberra for cleaning, reconstruction and analysis. The reconstruction of the Coobool Creek crania and mandibles occupied my time, more or less completely, for the next four to five months and changed the course of my thesis.

Emphasis was now placed on the description and comparison of the Coobool Creek remains and the extension and refinement of the morphological pattern which was evident in the Kow Swamp crania, mandibles and dentitions. Morphological, univariate and multivariate comparisons were made between the Coobool Creek mandibles, crania and dentitions and those from other prehistoric and recent Australian populations: a recent Murray Valley series, Kow Swamp, Swanport, Broadbeach and Roonka.

One of the major difficulties when working with the Kow Swamp series is that the sample is small and poorly preserved. This reduces the reliability of intrapopulation comparisons, using both univariate and multivariate procedures. In marked contrast to the Kow Swamp series, the Coobool Creek material is extremely well preserved and there are over 70 individuals represented.

In the past there has been too much emphasis placed on the morphology of individual specimens in Australian paleoanthropology (Smith, 1918; Wood, 1934b, Wunderly, 1943; Macintosh, 1970, 1971; Thorne, 1977; Thorne and Wilson, 1977; Freedman and Lofgren, 1979a). In part this is a direct result of the vagaries of preservation and discovery, though interpreters of these materials could have paid greater attention to the inter-population variation in Aboriginal cranial size and morphology. To obtain meaningful results, comparisons of geographic variation and temporal change in Australian Aboriginal skeletal material must be between populations rather than individuals. The excavation of material from Broadbeach and Roonka, and the reconstruction of the Coobool Creek series makes these comparisons possible.

Several areas of interest arising from analyses of the Kow Swamp series (Thorne and Macumber, 1972; Thorne, 1975, 1976, 1977; Thorne and Wilson, 1977; Pietrusewsky, 1979; Thorne and Wolpoff, 1981) could be explored in detail using the Coobool Creek sample. These included regional and temporal variation in the size and morphology of Australian Aboriginal mandibles, crania and dentitions, artificial cranial deformation, temporal variation in the thickness of the cranial vault and the morphological and metrical variation within the Coobool Creek and Kow Swamp samples.

Initial work is concerned with determining the sex of the Coobool Creek sample. Due to the high degree of sexual dimorphism in the morphology and size of Australian crania, mandibles and dentitions the correct determination of sex is crucial for analyses of geographic variation and temporal change. The Coobool Creek crania do not have associated postcranial skeletons, these are apparently still in the ground, and so sex determination

depended primarily on cranial morphology and size. This was complicated by temporal and cultural factors.

Having determined the sex of the Coobool Creek series the focus of this work is morphological and metrical description and comparison. Section 3 presents a morphological and metrical description of the Coobool Creek mandibles. Morphological and metrical comparisons are made with recent and other prehistoric Australian samples, Kow Swamp, Broadbeach, Swanport and a 'recent' Murray Valley series. The apparent temporal variation in the size and morphology of the mandible within the Murray River Valley is described.

The following section presents a morphological and metrical description of the Coobool Creek crania. Statistical comparisons are made with crania from Kow Swamp, Broadbeach, Swanport and the 'recent' Murray Valley sample. The alterations in cranial morphology associated with artificial cranial deformation are examined in detail and an attempt is made to isolate the anatomical regions unaffected by this practice. Emphasis is placed on the temporal changes in the size and morphology of the orofacial skeleton within the Murray River Valley.

Section 5 examines the size of the Coobool Creek dentitions with only limited morphological description due to the obliteration of surface morphological detail resulting from dental attrition. The Coobool Creek dentitions are compared with Australian Aboriginal samples from Kow Swamp, Broadbeach, Roonka, Swanport, Yuendumu, Western Australia and the 'recent' Murray Valley samples. Parallels are drawn between the tooth size complex in the Coobool Creek series and those in the *Homo erectus* samples from Sangiran and Choukoutien.

In the concluding section the Coobool Creek-Kow Swamp morphological pattern is described, an initial chronology for the Coobool Creek remains is presented, the evidence for structural reduction in the orofacial complex in the Murray River Valley over the last 10,000 years examined and finally the morphological and metrical features suggesting a regional morphological continuum with the Asian *Homo erectus* are discussed.

SECTION 1

MATERIALS AND THE METRICAL VARIABLES1.1 Materials.

There are two problems associated with analyses of evolutionary change in Australian Aboriginal skeletal material. Firstly there is a sampling difficulty brought about by the scarcity of material recovered from dated archaeological contexts. The second problem concerns the issue of regional variation, variation which has been seen to be the result of two distinct processes, either migration (Tindale and Birdsell, 1941; Birdsell, 1967; Howells, 1976; Thorne, 1980) or internal variation and adaptation (Abbie, 1951,1963).

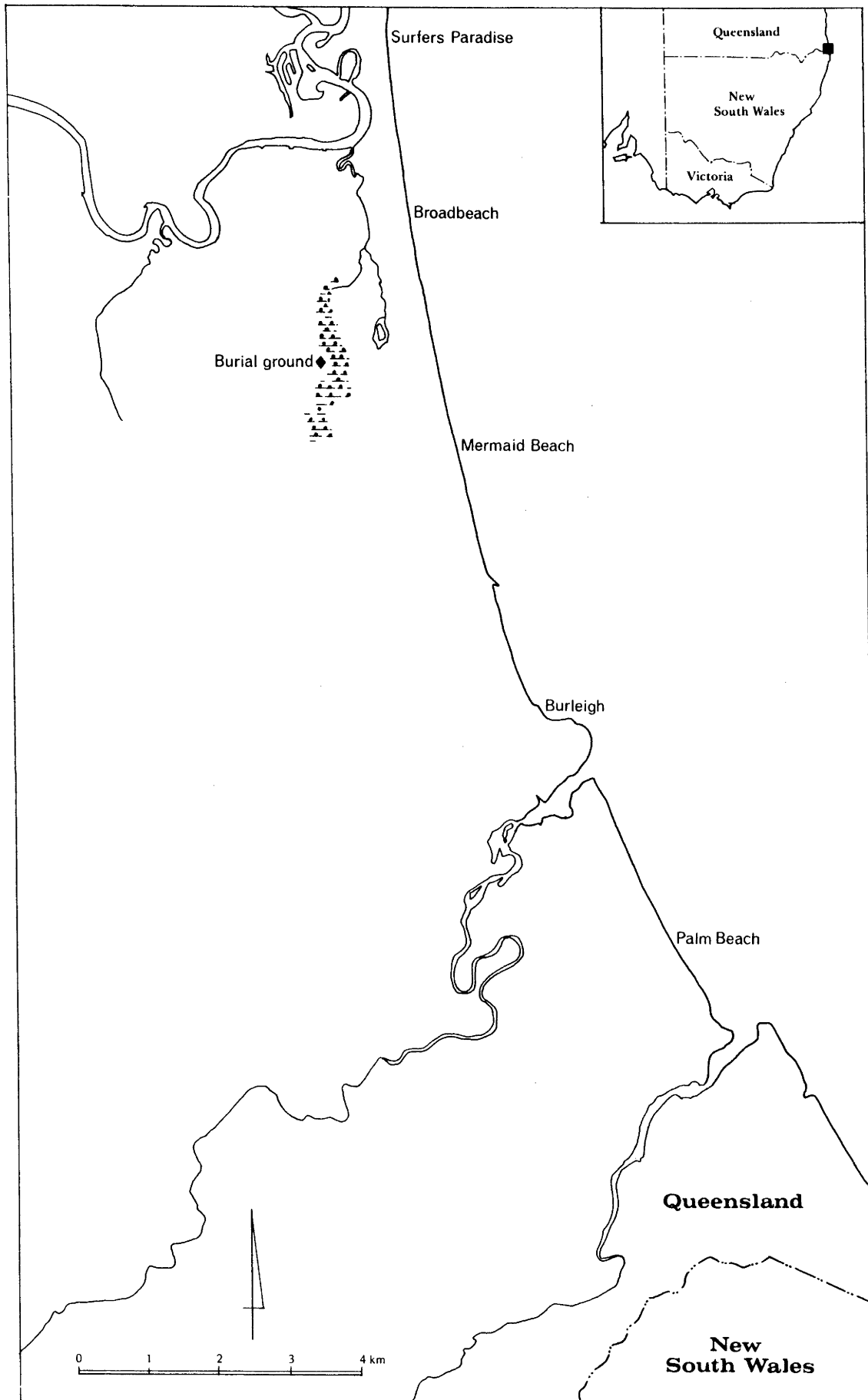
There are only three large skeletal series which have been recovered in the course of detailed archaeological excavation, within Australia: Broadbeach (Haglund-Calley, 1968a, 1968b; Haglund, 1976), Kow Swamp (Thorne, 1969, 1975, 1976) and Roonka (Pretty, 1977). The reconstruction of the undated Coobool Creek sample (Brown, 1981b) placed the geographical emphasis of this study within the Murray River Valley. In this region temporal control is provided by the Kow Swamp population dated to the period between 13,000 and 9,000 years BP (Thorne, 1975) and the Roonka series, with skeletal material from approximately 7,000 years BP up until the European contact period (Pretty, 1977). Although a considerable amount of skeletal material has been collected from this general area, the bulk of it comes from poorly defined geographical localities and without associated

stratigraphic and archaeological data. An examination of temporal change in skeletal features requires a grasp of both interpopulation and intra-population variation. The best available populations from the Murray River Valley are the collections from Kow Swamp, Roonka and Swanport. To this can be added the broader regional series collected from between Chowilla and Coobool by the late George Murray Black (Sunderland and Ray, 1959; Pietrusewsky, 1979; Brown, 1981a). A further control on both regional and temporal factors was gained by the addition of the contrasting Broadbeach series from southeastern Queensland (Haglund, 1976). The final sample consisted of skeletal material from Kow Swamp, Swanport, Roonka, Coobool Creek, Broadbeach and a 'modern' Murray Valley series.

There were two criteria used for the selection of crania from within each of these populations. Most importantly, only demonstrably adult skeletal material was used. A cranium was classified as adult if there was fusion of the sphenoccipital synchondrosis and the third molars were fully erupted. Crania in which there was congenital absence of the third molars but which were clearly adult according to factors of tooth wear and closure of the sphenoccipital synchondrosis were included. The second selection factor was preservation. Crania with evidence of postmortem warping or for which only a very limited number of variables could be recorded were excluded.

Broadbeach

The Broadbeach burial ground is located about 1.5km from the coastline at Mermaid Beach in southeastern Queensland (Map 1). Between 1965 and 1968 a series of archaeological excavations at the site recovered the partial or complete skeletal remains of more than one hundred individuals (Haglund-Calley, 1968a, 1968b; Wood, 1968; Haglund, 1976).



MAP 1: Location of the Broadbeach Aboriginal burial ground in south eastern Queensland.

Radiocarbon dating of charcoal found in association with the burials suggests that the site was in periodic use for more than 1000 years, from about 1290 years BP until the contact period (Haglund, 1976; Freedman and Wood, 1977). Although the remains of a large number of individuals were recovered from the site they are for the most part poorly preserved, with only 18 of the adult crania being reasonably complete.

Published analyses of the skeletal material are restricted to those of Freedman and Wood (1977), Pietruszewsky (1979) and Brace (1980). Freedman and Wood conclude that the Broadbeach material 'almost certainly represents a localised sample, probably a single tribe' and the results of their univariate and multivariate analyses distinguish between the Broadbeach crania and samples from Coastal N.S.W. and a broad Queensland series. The univariate analysis demonstrates the relatively large size of the Broadbeach crania and mandibles as their major distinguishing feature, while the multivariate comparison suggests that shape was also an important factor. Recently, Brace (1980), in his analysis of Australian Aboriginal tooth size clines, found that, with the exception of the Kow Swamp and Coobool Creek crania, the Broadbeach series had the largest summary tooth-size figure of his Australian samples.

Murray Valley

Between 1937 and 1950 G.M. Black dug up a large series of Australian Aboriginal skeletons from the area between Chowilla and Barham in the Murray River Valley. This material forms three separate collections in the Australian Institute of Anatomy in Canberra, the National Museum of Victoria and the Anatomy Department of the University of Melbourne. In only one of these collections (that in the Anatomy Department of the University of Melbourne)

can the cranial and postcranial elements of particular individuals be compared. Thus the Murray Valley cranial series used in this analysis was drawn from this collection, as cranial sexing could be validated and compared to sex determinations based on the pelvis (Sunderland and Ray, 1959; Brown, 1981a).

The sample used here consists of 100 adult crania collected in the period 1943-1950 from the area between Chowilla and Coobool in the Murray River Valley (Sunderland and Ray, 1959). Although there are more than 400 crania in the Anatomy Department's collection, many are fragmentary, with poor preservation of the face, mandible and dentition. The major criteria for the selection of crania were preservation, especially of the dentition, and the availability of an associated innominate to assist in sex determination.

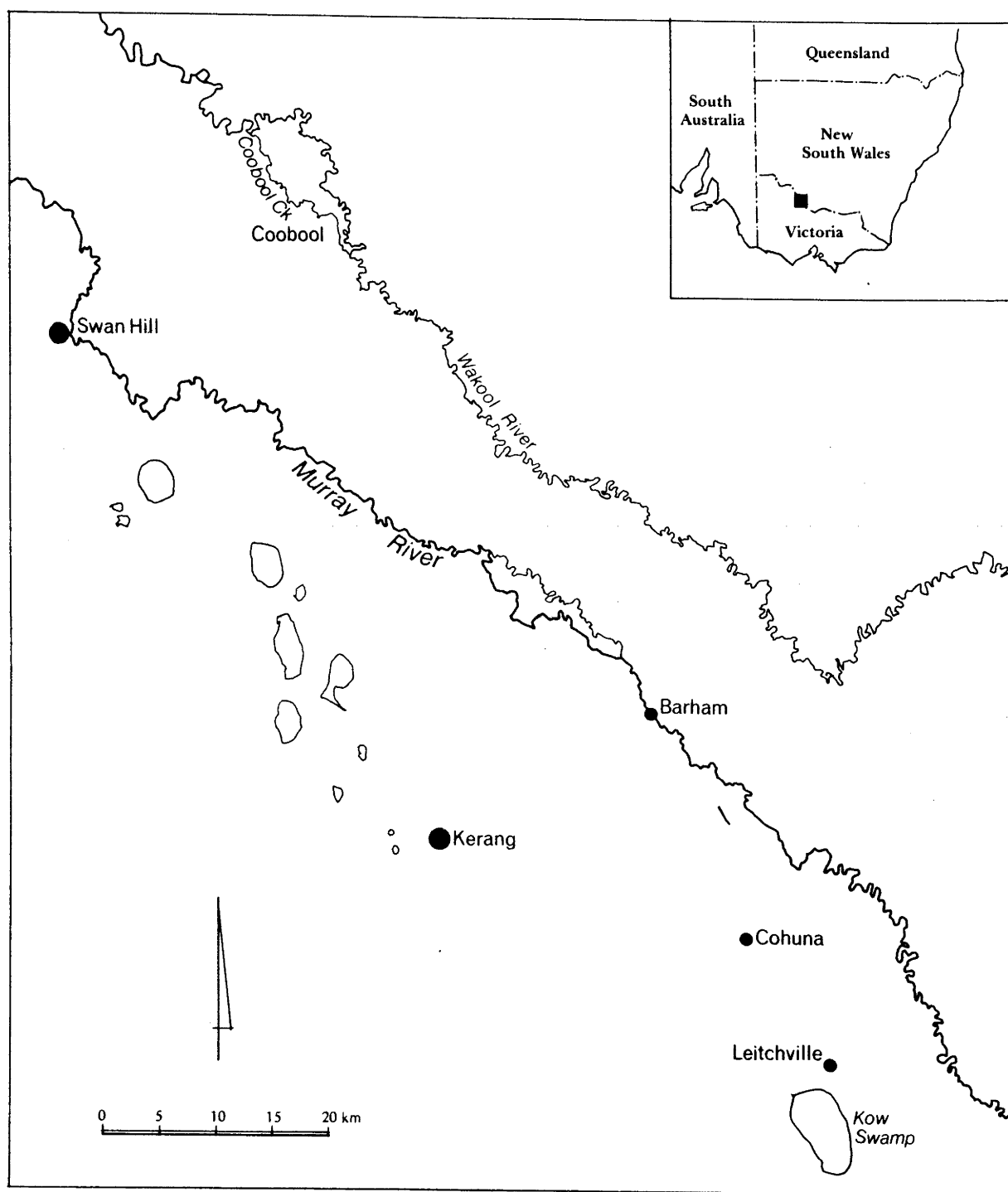
No stratigraphical, chronological, archaeological or even precise geographical information is recorded for this collection and to reduce the possibility of temporal changes in morphology influencing the results, only skeletons with a similar state of preservation were used. Crania that were carbonate-encrusted or manganese-stained were excluded. Comparison with the dated cranial series from Kow Swamp, Roonka and Chowilla (Blackwood and Simpson, 1973) suggests that the Murray Valley material can be considered to be broadly recent, 5,000 to 100 years BP. Pietrusewsky's (1979) multivariate analysis of Australian Aboriginal crania clustered the Murray Valley crania with the recent material from Broadbeach, Roonka and Swanport. However, the lack of temporal control in the Murray Valley series remains a possible source of error.

In addition 60 crania and mandibles from Euston were used for purposes of morphological comparison and in the analysis of dental attrition. These crania form part of the Murray Black collection in the Australian Institute of Anatomy in Canberra. The skeletal material in the Institute of Anatomy collection has been completely disarticulated and elements of the postcranial skeleton cannot be assigned to individual crania. The Euston sample was sexed by the combined morphological and module technique developed by Larnach and Freedman (1964) which I have modified for use with crania from the Murray River Valley (Brown, 1981a). Thirty male crania and 30 female crania form the Euston sample. A detailed description of the techniques used to sex isolated crania will be found in the section on sex determination.

Coobool Creek

The Coobool Creek crania form part of the 'Murray Black' collection in the Anatomy Department of the University of Melbourne. This material was collected from a site near 'Doherty's Hut' at Coobool Crossing on the Wakool River between Swan Hill and Deniliquin in southern N.S.W. (Map 2) by Black during 1950 (L.J. Ray Personal communication). As is the case for the rest of the Murray Black collection no stratigraphic or detailed locational information is recorded for this material. I surveyed the area during 1980 but failed to locate the site.

The only descriptive work previously published on the Coobool Creek series is by Brace (1980) and Brown (1981b). Brace compared the Coobool Creek dentitions with those from Kow Swamp and remarked that in both cranial and postcranial form the Coobool Creek material displays a degree of robustness well beyond that of the most rugged recent Aborigines. Both morphologically and metrically the Coobool Creek crania fall within the range of



MAP 2: Location of Coobool Creek, Kow Swamp and Cohuna in the central Murray River Valley.

variation exhibited by the Kow Swamp and Cohuna material (Brown, 1981b). Although some of the similarities in this material result from artificial deformation, there are other features of the face, mandible and dentition, areas unaffected by deformation, which separate these crania from other Australian Aboriginal populations (Brown, 1981b).

Most of the 70 crania in the Coobool Creek series were covered with a thick irregular layer of silicious carbonate, with heavy mineralisation of the bone. For the most part the crania and mandibles were collected without their associated postcranial skeletons. These are apparently still in the ground. Sixteen of the more complete crania (the criteria being a well preserved base, face and dentition) were selected for cleaning and reconstruction. In fifteen of these the face had become detached from the vault and required varying degrees of reconstruction. Fourteen of the 16 crania had associated mandibles. These were all broken, anteriorly at the symphysis and posteriorly in the corpus, rami and condyles. These crania were made available on loan for cleaning, reconstruction and analysis in Canberra. An additional eight crania were suitable for analysis without complex reconstruction.

On arrival in Canberra the crania were first photographed. Then the initial removal of the carbonate crust was undertaken using an electric dental drill (12,000 rpm) fitted with diamond dust bits. The larger nodules of carbonate were removed and the overall thickness of the crust reduced. The crania were then totally immersed in 6 percent acetic acid for varying periods up to 12 hours. This generally removed a large part of the remaining carbonate. Each cranium was then rinsed in distilled water for 24 hours and air-dried. Any remaining carbonate was removed using diamond dust dental drills and manual carving tools.

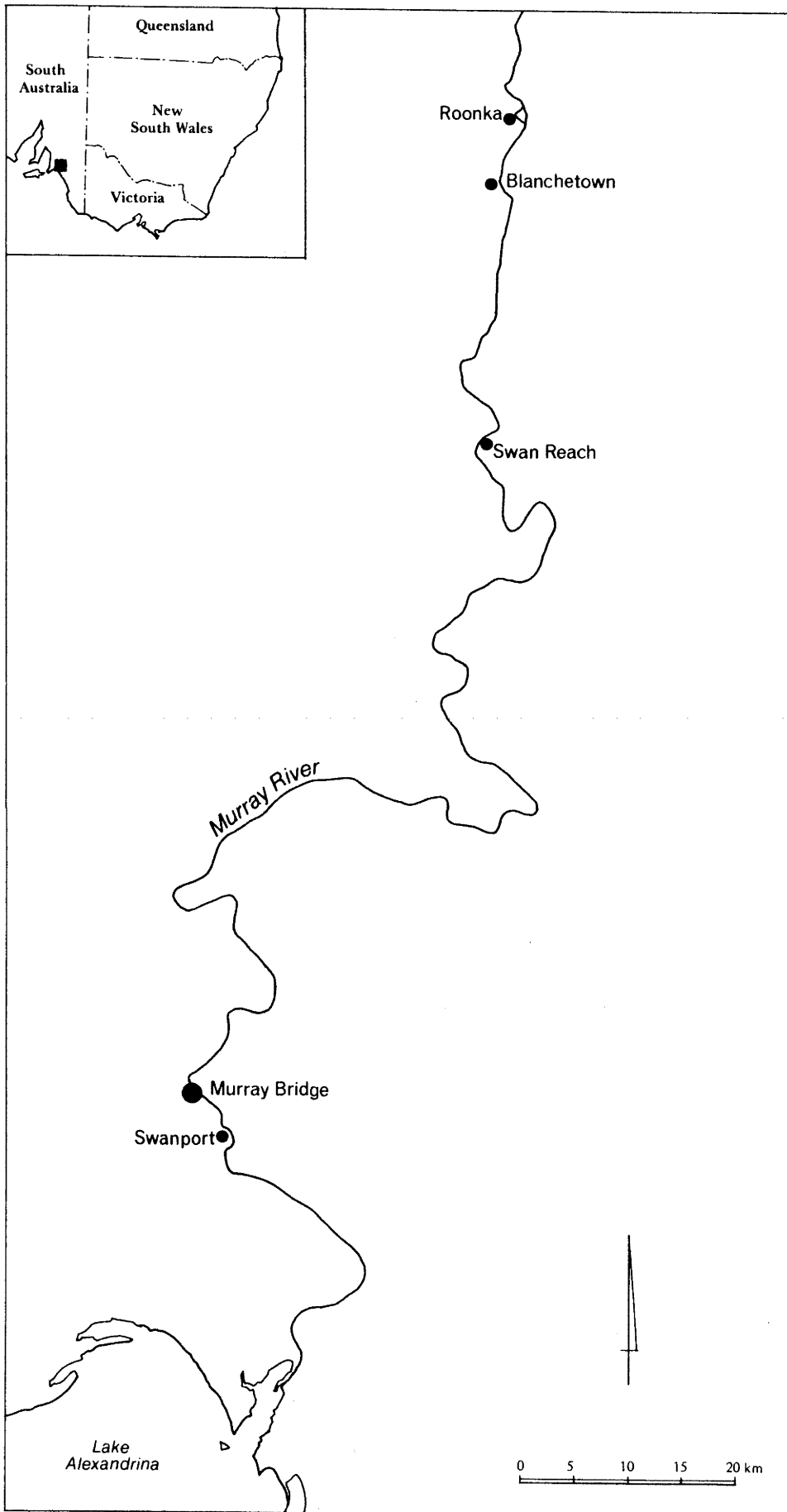
Reconstruction, where necessary, was undertaken using an adhesive (Tarzans Grip), wax bridges and *sate* stick supports. In most cases the faces needed considerable wax reinforcement. The restoration of the 16 crania, 14 with associated mandibles, an isolated face with associated mandible, a fragmentary isolated mandible, a clavicle and four cervical vertebrae took four months.

None of the reconstructed crania has sufficient associated post-cranial material for a positive identification of sex. Several factors, notably the large size and in some cases the presence of artificial deformation, limited the sexing techniques that could be applied to this material. This will be discussed in detail in the section on sex determination.

Swanport

The large skeletal series from Swanport were collected primarily by F.R. Zeitz from a site 10 km southeast of Murray Bridge, South Australia, in 1911 (Map 3). Stirling (1911) briefly described the stratigraphy of the site and argued, primarily on the basis of local oral history, that the burials probably overlapped the European contact period. The Swanport material, although undated, is generally accepted as representing a recent population (Howells, 1976a; Giles, 1976; Pietrusewsky, 1979). Pretty (1977) draws attention to the parallels between the recent material from Roonka and that from Swanport, both in terms of the artifact assemblage and the form of the burials.

The cranial remains of approximately 90 individuals were recovered from the initial excavation, 11 with associated postcranial skeletons, and lodged in the South Australian Museum, with another 40 being collected from the general area after 1911. Forty-eight crania with well preserved



MAP 3: Location of Swanport and Roonka in eastern South Australia.

dentitions, face and vaults were selected for this analysis. In only seven of these could the sex be identified through an associated pelvis. The sex of each cranium was determined with the Larnach and Freedman (1964) technique and through the use of discriminant functions developed with the Murray Valley sample. This will be discussed in detail in the section on sex discrimination.

Kow Swamp

Archaeological excavation at Kow Swamp, 10 km southeast of the town of Cohuna in the central Murray River Valley (Map 2), between 1968 and 1972 recovered the partial skeletal remains of more than 22 individuals (Thorne, 1969, 1971a, 1971b, 1972, 1975, 1976, 1977; Thorne and Wolpoff, 1981). Radiocarbon determinations on shell from the grave of KS5 of $13,000 \pm 280$ (ANU-1236) and on bone apatite from KS9 of $9,590 \pm 130$ (ANU-532) place this population firmly in the late Pleistocene (Thorne, 1975).

Morphological and metrical comparisons of these crania have distinguished them from modern Australian Aboriginal crania (Thorne, 1975; Pietrusewsky, 1979) and a more gracile group of Pleistocene crania represented by Mungo 1, Mungo 3, and Keilor (Thorne, 1977; Thorne and Wilson, 1977). Most significantly Thorne and Wolpoff (1981) have provided the first detailed argument for a regional clade containing the Kow Swamp crania and the *Homo erectus* material from Indonesia. While I have argued (Brown, 1981b) that some of the Kow Swamp crania are artificially deformed, several features unaffected by deformation (especially the morphology and size of the dentition, mandible and palate in this population) support the argument for a regional clade.

Despite extensive reconstruction the Kow Swamp material is still extremely fragmentary, with only two of the crania, KS1 and KS5, being relatively complete. Preservation is particularly poor for the basal areas of the crania. Data from Kow Swamp crania KS1, KS2, KS5, KS7 and KS15 have been included in this analysis as these specimens have the most complete dentitions.

Cohuna

The Cohuna cranium was discovered by George Gray in 1925 during the excavation of an irrigation channel close to the northern margin of Kow Swamp (Macintosh, 1952a, 1953). The cranium is undated.

Following chemical and physiographic analysis Macintosh (1953) concluded that the cranium had become mineralised on Mount Hope and transported to the discovery site by water action. More recent research (Macumber and Thorne, 1976) indicates that mineralisation of the cranium occurred in the soil in which it was found. Morphological and statistical comparisons have placed the Cohuna cranium firmly within the Kow Swamp population (Thorne, 1975; Brown, 1981b) and for the remainder of this analysis it will be placed within the Kow Swamp sample. Although discovered in 1925, a detailed description of the Cohuna cranium has still not been published. Macintosh (1952b) has made a detailed description of the teeth and palate.

Roonka

The Roonka site is located on the Murray River, approximately 5 km south of Blanchetown in South Australia (Map 3). Pretty (1977) has made a preliminary description of the stratigraphy of the site, the artifactual assemblage and a brief analysis of the burials. The skeletal remains of

more than 120 individuals have been recovered from trench A, with radiocarbon determinations indicating a sequence from 7,000 years BP until the contact period. The initial reconstruction and description of this material was undertaken by Prokopec (1979). Unfortunately the material has been extensively altered by postdepositional warping and erosion with the resultant extensive reconstructions being fictitious. This has seriously affected the amount of reliable information that can be gained from this material. I examined all the cranial material from the Roonka site but include here only the dental statistics for 7 crania that can be assigned to phase II of the site, which is dated to the period 4000-7000 years BP (Pretty, 1977: 315). These 7 crania (Roonka 6, 37, 66, 89, 91, 104 and 106) all appear to be older than the juvenile cranium Roonka 48 which has been dated through charcoal associated with the burial to 3930 ± 120 (ANU-407) (Pretty, 1977:297).

1.2 The Metrical Variables.

Several factors influenced the selection of the metric variables for this study. Principal among these was the need for a detailed description of the Coobool Creek crania, mandibles and dentition and comparison with the skeletal material from Kow Swamp, Swanport, Broadbeach and the Murray River Valley. In particular, the Kow Swamp material is fragmentary, with poor preservation of the basi-occipital area. In order to compare adequately skeletal material in varying states of preservation, an extensive list of craniometric variables was chosen. As arguments bearing on the absolute age of the Coobool Creek skeletal material rest largely on comparisons with the dated Kow Swamp material, a number of variables was selected specifically for this comparison.

Another factor was the desire to examine the question of temporal changes in the size and morphology of the cranium, mandible and dentition of the Murray River Valley Aborigines. The variables selected were chosen to facilitate this.

Lastly the list of variables was expanded during the course of the project to allow the examination of morphological questions arising out of the ongoing analysis. Most significant among these was the issue of artificial cranial deformation which required a more detailed examination of cranial curvature and breadth. The gradual expansion of the variable list, and changes of emphasis during the course of the project, largely brought about by the reconstruction of the Coobool Creek material, has resulted in the complete variable list being recorded for only three of the samples (Coobool Creek, Kow Swamp and Murray Valley). The Broadbeach and to a lesser extent Swanport series, which were examined before the reconstruction of the Coobool Creek material, have a slightly shortened cranial variable list.

The craniometric variables used in this analysis were recorded directly from the crania and mandibles using standardised equipment (GPM sliding, spreading and coordinate calipers, mandibulometer and anthropometric tape). All linear dimensions on crania and mandibles were recorded to the nearest millimeter. Dentitions were measured to the nearest 0.1 millimeter using a modified Mitutoyou dial caliper with fine, sharpened beaks. All the measurements used in this analysis were taken by the author and recorded directly onto standard computer data sheets. This reduced possible errors resulting from transcription. Next to each variable in the variable list is its alphanumeric identification (I1 to I120). These will occasionally be used as a shorthand variable identification, both in tables and in the text.

The first seven variables recorded for each individual were the seven Larnach and Freedman (1964) sexing characters. These consist of (I1) glabella prominence, (I2) superciliary ridge prominence, (I3) zygomatic trigone development, (I4) malar tuberosity size, (I5) mastoid size, (I6) occipital markings and (I7) palate size. These seven variables are discussed below in the section on sex determination. The metrical variables (I8 to I120) are listed as they were placed on the record sheets. My original intention was to measure crania by recording first all the dimensions requiring the use of a spreading clipper then move to measurements requiring a sliding caliper, coordinate caliper, anthropometric tape and dial caliper. This began as an efficient approach to measurement but with the addition of a number of new variables this sequence was lost. The recording of such a large number of variables was extremely tedious and there is undoubtedly some redundancy in the final data set. However, in anthropometric work which is essentially exploratory (and when much of the material is fragmentary), it is difficult to predict all the redundant variables at the outset. With hindsight, the extensive coverage of these variables has proved fortunate.

CRANIAL VARIABLES

- | | |
|--|---|
| (I8) maximum bi-parietal breadth ¹ | (I41) basion-staphylion ² |
| (I9) glabella-opisthocranion ¹ | (I42) lambda-bregma ³ |
| (I10) glabella-lambda ¹ | (I43) lambda-inion ² |
| (I11) basion-bregma ¹ | (I44) lambda-asterion ² |
| (I12) basion-nasion ¹ | (I45) auriculare-bregma ² |
| (I13) basion-nasospinale ¹ | (I46) auriculare-glabella ² |
| (I14) basion-prosthion ¹ | (I47) auriculare-nasion ² |
| (I15) basion-lambda ² | (I48) auriculare-nasospinale ² |
| (I16) basion-inion ² | (I49) auriculare-prosthion ² |
| (I17) bi-auriculare ² | (I50) auriculare-zygomaxillary ² |
| (I18) bi-asterion ² | (I51) auriculare-lambda ² |
| (I19) bi-sphenion ¹ | (I52) auriculare-inion ² |
| (I20) glabella-bregma ² | (I53) auriculare-opisthion ² |
| (I21) nasion-bregma ³ | (I54) auriculare-basion ² |
| (I22) metopion height ³ | (I55) auriculare-asterion ² |
| (I23) nasion-metopion ³ | (I56) nasion-nasospinale ² |
| (I24) maximum supraorbital breadth ² | (I57) nasion-prosthion ² |
| (I25) maximum posterior frontal breadth ² | (I58) nasospinale-prosthion ² |
| (I26) minimum postorbital breadth ² | (I59) nasal breadth ² |
| (I27) minimum bi-temporal lines ² | (I60) orbital height ² |
| (I28) bi-zygion ² | (I61) orbital breadth ² |
| (I29) bi-zygomaxillary ² | (I62) bi-ectoconchion ² |
| (I30) bi-stephanion ² | (I63) frontal arc ⁴ |
| (I31) bi-stenionic ² | (I64) parietal arc ⁴ |
| (I32) opisthion-inion ² | (I65) occipital arc ⁴ |
| (I33) opisthion-lambda ² | (I66) alveolar length ² |
| (I34) opisthion-asterion ² | (I67) alveolar breadth ² |
| (I35) opisthion-glabella ¹ | (I68) mastoid depth ² |
| (I36) foramen magnum length ² | (I69) bi-canine breadth ² |
| (I37) foramen magnum breadth ² | (I70) P1-M2 length ⁵ |
| (I38) basion-sphenobasion ² | (I71) M1-M2 length ⁵ |
| (I39) basion-asterion ² | (I72) parietal subtense height ³ |
| (I40) basion-mastoidale ² | (I73) bregma-parietal subtense ³ |

¹ spreading caliper² sliding caliper³ coordinate caliper⁴ anthropometric tape⁵ Mitutoyou caliper

MAXILLARY TOOTH BREADTHS

(I74) left medial incisor	(I82) right medial incisor
(I75) left lateral incisor	(I83) right lateral incisor
(I76) left canine	(I84) right canine
(I77) left first premolar	(I85) right first premolar
(I78) left second premolar	(I86) right second premolar
(I79) left first molar	(I87) right first molar
(I80) left second molar	(I88) right second molar
(I81) left third molar	(I89) right third molar

MANDIBULAR VARIABLES

(I90) symphyseal height ¹	(I98) maximum ramus breadth ¹
(I91) symphyseal thickness ¹	(I99) minimum ramus breadth ¹
(I92) corpus height ¹	(I100) condyle length ¹
(I93) corpus thickness ¹	(I101) condyle breadth ¹
(I94) bi-condylar breadth ¹	(I102) dental arch breadth ¹
(I95) bi-gonial breadth ¹	(I103) P1-M2 length ³
(I96) mandibular length ²	(I104) M1-M2 length ³
(I97) ramus height ²	

¹ sliding caliper ² mandibulometer ³ Mitutoyou caliper

MANDIBULAR TOOTH BREADTHS

(I105) left medial incisor	(I113) right medial incisor
(I106) left lateral incisor	(I114) right lateral incisor
(I107) left canine	(I115) right canine
(I108) left first premolar	(I116) right first premolar
(I109) left second premolar	(I117) right second premolar
(I110) left first molar	(I118) right first molar
(I111) left second molar	(I119) right second molar
(I112) left third molar	(I120) right third molar

Variable description

A detailed description (in German) of the full range of anatomical points and features used in osteological research can be found in Martin and Saller (1957). In the selection of the mandibular variables I have been influenced by the observations of Freedman and Wood (1977) and they provide detailed descriptions of the majority of the mandibular variables used in this analysis. The following variable descriptions define the location of the anatomical points used in the variable list, as well as presenting the formulae for the modules and indices used in the text.

For all the claims for anthropometrics as an objective science a survey of the descriptive literature on anthropometric methodology (Martin and Saller, 1957; Stewart, 1947; Montagu, 1960; Comas, 1960; and Krogman, 1962) reveals alarming conflicts in descriptions of 'standard' anthropometric points. The variable descriptions which I have used are not meant to represent a consensus of these views, but simply correspond to points defining the measurements used in this analysis. Where I have used a point which does not correspond exactly to one in the literature, it is not referenced. The definition in this case is my own.

Alveolar breadth: bi-ectomolare (Larnach and Macintosh, 1966:73).

Alveolar length: distance from alveolon to prosthion (Larnach and Macintosh, 1966:73).

Alveolon: the middle of a transverse line connecting the posterior extremities of the maxillary alveolar border (Martin and Saller, 1957:451).

Asterion: junction of the temporo-parietal with the lambdoid suture (Martin and Saller, 1957:447).

Auriculare: the most lateral point on the root of the zygoma vertically above the centre of the auditory meatus (Martin and Saller, 1957:447).

Basion: the lowest median point on the anterior border of the foramen magnum (Martin and Saller, 1957:446).

Bicanine breadth: maximum external canine breadth with the tip of the calipers placed on the most prominent point of the canine eminence at the alveolar margin of the maxilla.

Bicondylar breadth: the distance between the most lateral points on the two mandibular condyles (Stewart, 1947:196).

Bigonial breadth: the maximum diameter externally on the angles of the mandible (Stewart, 1947:153).

Bregma: the point of intersection of the coronal and sagittal sutures (Martin and Saller, 1957:444).

Condyle breadth: maximum medial-lateral breadth of the mandibular condyle.

Condyle length: maximum anterior-posterior length of the mandibular condyle.

Corpus breadth: maximum thickness of the mandibular corpus at the level of M1-M2 (Thorne, 1975).

Corpus height: the height of the corpus between M1-M2 (Thorne, 1975).

Frontal curvature index: metopion height x 100 divided by nasion-bregma chord (Larnach and Macintosh, 1966:17).

Ectoconchion: the point on the lateral margin of the orbit marking the greatest breadth (Krogman, 1962:316).

Ectomolare: the most lateral point on the outer surface of the alveolar ridge, opposite the centre of the second maxillary molar (Martin and Saller, 1957:451).

Glabella: in the Frankfurt horizontal plane glabella is the most anterior midline point on the frontal bone (Martin and Saller, 1957:442).

Gnathic index: basion-prosthion x 100 divided by basion-nasion (Krogman, 1962:320).

Gnathion: the lowest point, in the midline, on the inferior border of the mandible (Martin and Saller, 1957:452).

Gonion: the most lateral external point of junction of the horizontal and ascending *rami* of the mandible (Comas, 1960:402).

Infradentale: the most antero-superior point on the alveolar margin between the mandibular central incisors (Martin and Saller, 1957:452).

Inion: the point where the superior nuchal lines meet at the midline.

Lambda: intersection of the sagittal and lambdoid sutures (Martin and Saller, 1957:444).

Mandibular dental arch breadth: measured externally with the tips of the calipers placed on the cemento-enamel junction, above the anterior root, of the second molars. Breadth of the dental arch at this point.

Mandibular length: this measurement, taken on the mandibulometer, is the maximum length of the complete mandible from the most anterior point on the symphysis to the most posterior points on both condyles (Larnach and Macintosh, 1971:28).

Mastoideale: the lowest point on the mastoid process (Martin and Saller, 1957:448).

Mastoid depth: this measurement called mastoid length by Larnach and Macintosh, was taken from a point on the Frankfurt line vertically downwards to the tip of the mastoid process (Larnach and Macintosh, 1966:43).

Maximum supraorbital breadth: 'the maximum diameter of the frontal bone across the supraorbital ridges. Where the ridges are strongly developed on the zygomatic trigones the lateral points are located on the actual projections of these trigones. This is often the case in Australian Aboriginal crania. On some gracile female crania the most lateral points on the frontal bone may be actually on the fronto-malar suture' (Larnach and Macintosh, 1970:12).

Maximum posterior frontal breadth: the maximum breadth of the frontal bone if it is located posterior of supraorbital breadth. This dimension was recorded along with supraorbital breadth if the posterior dimension was greater. In the majority of the Aboriginal crania examined, the maximum breadth of the frontal was supraorbital (the only exception was a few female crania). Maximum posterior frontal breadth was rarely recorded.

Maximum ramus breadth: 'distance from the most prominent point on the anterior border of the coronoid process to the farthest point on the posterior border of the bone. The measurement is obtained by applying one of the branches of the sliding caliper tangentially to the posterior border of the mandible, and bringing the other branch in contact with the anterior border of the coronoid process' (Stewart, 1947:197).

Metopion: point in the median sagittal plane where frontal bone elevation above the nasion-bregma chord is at a maximum (Martin and Saller, 1957:444).

Minimum ramus breadth: the smallest antero-posterior diameter of the ramus (Stewart, 1947:154).

Nasal breadth: the maximum breadth of the nasal aperture, between the anterior surfaces of its lateral margins (Comas, 1960:404).

Nasion: the point at which the nasal meets the frontonasal suture (Martin and Saller, 1957:448).

Nasospinale: the point at which a line tangent to the lower margins of the nasal aperture is intersected by the mid-sagittal plane (Montagu, 1960:48).

Occipital curvature index: occipital subtense height x 100 divided by lambda-opisthion chord (Brown, 1981b).

Occipital subtense height: point in the median sagittal plane where occipital bone elevation above the lambda-opisthion chord is at a maximum.

Opisthion: the midpoint of the posterior border of the foramen magnum (Stewart, 1947:136).

Opisthocranion: the most distant (posterior) point on the cranium from glabella in the mid-sagittal plane, excluding the external occipital protuberance (Comas, 1960:398).

Orbital breadth: distance between ectoconchion and dacryon (Comas, 1960:404).

Orbital height: the maximum internal height of the orbit perpendicular to its breadth (Comas, 1960:404).

Palate module: maximum alveolar length x maximum alveolar breadth divided by 100 (Larnach and Macintosh, 1966:73).

Parietal curvature index: parietal subtense height x 100 divided by bregma-lambda chord (Larnach, 1974:25).

Parietal subtense: point where parietal bone elevation above the bregma-lambda chord is at a maximum (Larnach, 1974:25).

Postorbital breadth: the minimum postorbital breadth of the frontal bone. This measurement corresponds with Martin and Saller's measurement number 9 (Martin and Saller, 1957:458).

Prosthion: the most antero-inferior point on the maxilla between the upper central incisors (Martin and Saller, 1957:449).

Ramus height: the vertical height of the condyle above the standard horizontal plane, measured with a mandibulometer (Martin and Saller, 1957:482).

Sigmoid notch depth: maximum depth of the sigmoid notch measured vertically from the tangent for the uppermost points on the condyle and the coronoid process (Larnach and Macintosh, 1971:21).

Sphenion: junction of the coronal suture with the sphenoid bone (Martin and Saller, 1957:447).

Sphenobasion: median sagittal point on the sphenoccipital synchondrosis (Martin and Saller, 1957:446).

Staphylion: the point where a line tangent to the most anterior border of the posterior margins of the palatine bones crosses the midline (Martin and Saller, 1957:450).

Stenion: medial point on the sphenosquamosal suture (Martin and Saller, 1957:448).

Stephanion: point where the superior temporal line crosses the coronal suture (Martin and Saller, 1957:447).

Symphyseal breadth: the maximum antero-posterior dimension of the mandibular symphysis (Thorne, 1975).

Symphyseal height: height of the mandibular symphysis measured from its lowest median point (gnathion) to the tip of the alveolar process between the medial incisors (infradentale) (Stewart, 1947:151).

Tooth breadth (buccolingual crown diameter): 'the greatest distance between the labial or buccal surface and the lingual surface of the tooth crown measured with a sliding caliper held at right angles to the mesiodistal crown diameter of the tooth' (Townsend and Brown, 1979b:20).

Tooth length (mesiodistal crown diameter): 'the greatest distance between the approximate surfaces of the crown measured with a sliding caliper held parallel to the occlusal and vestibular surfaces of the crown' (Townsend and Brown, 1979b:19).

Upper facial index: nasion-prosthion x 100 divided by bi-zygion (Montagu, 1960:53).

Zygion: the most lateral point on the zygomatic arch (Martin and Saller, 1957:450).

Zygomaxillare: the lowest point externally on the zygomaxillary suture (Martin and Saller, 1957:450).

SECTION 2

SEX DETERMINATION

As long as the sexing of the skulls remains a question of individual judgement, nothing approaching mathematical accuracy can be expected from the results of measurements.

(Parsons, 1908:420)

The considerable sexual differences in the Australian aborigines makes the sexing of most of the skulls fairly easy.

(Fenner, 1939:249)

The high degree of regional and sex based variation in Australian Aboriginal crania makes the accurate determination of sex crucial for inter-population comparisons. However, until comparatively recently, sex determination of isolated Australian Aboriginal crania was a matter of individual experience and judgement (Klaatsch, 1908; Hrdlička, 1928; Fenner, 1939). There were pitifully few crania in which the sex could be independently sexed through an associated axial skeleton so the accuracy of sex determinations based on isolated crania could not be objectively assessed. This situation was made more difficult by the initial impression that Australian Aboriginal crania were so dimorphic that they were easy to sex (Fenner, 1939). As Hrdlička (1928) had previously noted this initial impression of a clear sex based bimodality in the distribution of the crania was an artifact of the extremes of variation, male and female. There was in fact a large area of overlap in the distribution of the male and female crania that made determining the sex of some crania extremely difficult.

The development of techniques for sexing isolated human crania, whether based on purely morphological criteria, combined morphological and metrical methods, or multivariate discriminant function analysis has always involved a persistent 10-20 percent of crania that remain doubtful. Keen (1950) using 23 metrical and morphological traits on a South African 'Cape Coloured' population of known sex achieved an accuracy of 85 percent. A similar result, 82-89 percent, was obtained by Giles and Elliot (1963) with a discriminant function analysis of American Negro and White crania.

It is unlikely that any method of sex determination based on isolated bones of the human skeleton, including the pelvis (Washburn, 1948), will ever achieve a resolution greater than 85-90 percent. Indeed Hooton (1943) suggested that even with the whole skeleton sexing is possible in only 90 percent of cases. This is a product of the intrinsic variation, both morphological and metrical, found in the human skeleton. The male and female ranges for most osteological features overlap, producing an interphase zone. In the Australian Aborigine this interphase of male and female osteological features is documented for the cranium (Larnach and Macintosh, 1966, 1970; Brown, 1973; Thorne, 1975; Margetts and Freedman, 1977; Freedman and Wood, 1977), mandible (Larnach and Macintosh, 1971), pelvis (Davivongs, 1963a), femur (Davivongs, 1963b), clavicle (Ray, 1959; van Dongen, 1963), humerus and scapula (van Dongen, 1963) and dentition (Barrett, *et al.*, 1964; Townsend and Brown, 1979a, 1979b).

The first attempt to sex a large series of isolated Australian Aboriginal crania was made by Klaatsch (1908). Working within the limitations of collections in which few of the crania had associated innomines, Klaatsch noted that female crania could be distinguished by their smaller size,

poorly developed muscular prominences, greater prognathism, smaller teeth and jaws, less developed superciliary ridges and more prominent forehead. He concluded 'as in other races the infantile character is better preserved in the female than in the male' (1908:151). In 1964 Larnach and Freedman formalised and extended Klaatsch's work with the development of a combined morphological and metrical technique for determining the sex in isolated Australian Aboriginal crania. This remains the sole method of sex determination developed specifically for Australian crania. Since then, Australian Aboriginal crania with inadequate axial skeletons for positive sex identification have been sexed by this method (Freedman, 1964; Larnach and Macintosh, 1966, 1970; Thorne, 1975; Wallace and Doran, 1976; Margetts and Freedman, 1977; Freedman and Lofgren, 1979a; Pietrusewsky, 1979).

There have always been two major problems associated with the use of the Larnach and Freedman technique. Firstly, although 107 coastal N.S.W. crania were used to develop the method, only 18 of these could be independently sexed through an associated axial skeleton. Secondly, there is a large degree of regional variation in Australian Aboriginal crania (Giles, 1976; Pietrusewsky, 1979), variation which may influence expression of the morphological and metrical characters used in the technique. Primarily due to this regional variation I examined the issue (Brown, 1981a) to develop a version of the technique suitable for use with Aboriginal crania from the Murray River Valley.

An alternative approach to sex determination is the use of linear discriminant functions developed on crania from a known sex population to determine the sex of isolated crania, either from the initial or an adjacent population (Thieme and Schull, 1957; Hanihara, 1958, 1959; Giles and Elliot, 1963; Kajanoja, 1966). Although discriminant functions developed on other

populations have been used to sex Australian Aboriginal crania (Larnach and Freedman, 1964; Brown, 1981a), discriminant functions have not been developed from a known sex Australian series. It has been found also that while discriminant functions produce accurate results for the population on which they were developed, a reduced level of correct identification can be expected when the techniques are applied to different populations (Birkby, 1966; Kajanoja, 1966; Henke, 1974). For this reason a discriminant function technique is developed here, based on the known sex Murray Valley crania, to provide a method to be used in tandem with the modified Larnach and Freedman method (Brown, 1981a).

1. Modified Larnach and Freedman Technique

One-hundred Australian Aboriginal crania with associated innominates formed the Murray Valley sample. Sex was determined through an examination of the Ischium-Pubis Index, the depth and width of the greater sciatic notch and the breadth of the acetabulum as defined by Davivongs (1963a). Only individuals with clearly male or female innominates were included in the sample (47 males and 53 females).

The Larnach and Freedman technique entails the assessment of five morphological features and the calculation of two modules. For each of these characters three classes are delineated. Class 1 in each case represents the most characteristically female form of the feature, class 3 the most male, and class 2 the intermediate group. Each character is scored out of three and a total score, the sum of the seven characters, is given out of a possible 21. Larnach and Freedman classed individuals scoring 7-11 as female and those scoring 12-21 as male.

Assessment of the five cranimorphic sexing characters (glabella prominence, superciliary ridge development, zygomatic trigone size, malar tuberosity prominence and the development of the occipital muscle markings) in the Murray Valley sample was based on a set of standard casts of the original specimens that defined the class two limits. These were supplied by the Department of Anatomy, University of Sydney. The dimensions used to determine palate and mastoid size were recorded to the nearest millimeter using the procedure defined by Larnach and Freedman (1964). The raw scores, class percentages, means, standard deviations and tests of significance for these data are presented in Brown (1981a) and will not be discussed in detail here.

The initial application of the Larnach and Freedman technique indicated that 39.6 percent of the Murray Valley female crania (as sexed on innominates) gained a total sex score higher than the Larnach and Freedman section point of 11. The Murray Valley female range was 7-16 and males 12-21. The section point of 14.5, calculated from the male and female means, correctly sexed 92.5 percent of the female crania and 91.4 percent of the males. There was, however, a large area of overlap (scores 12-16) between the male and female ranges containing 34 percent of the total crania (Figure 1).

A comparison of the Murray Valley and Larnach and Freedman's Coastal N.S.W. data indicated that the major discontinuity was palate and mastoid size. Murray Valley palates and mastoid processes are significantly larger ($P = .01-.001$) than those from Coastal N.S.W. The recalculation of the class two limits for palate size (increased from 35-39 to 39-42) and mastoid size (increased from 55-80 to 75-105) increased the bimodality of the sex score distribution in the Murray Valley sample (Figure 2). The area of

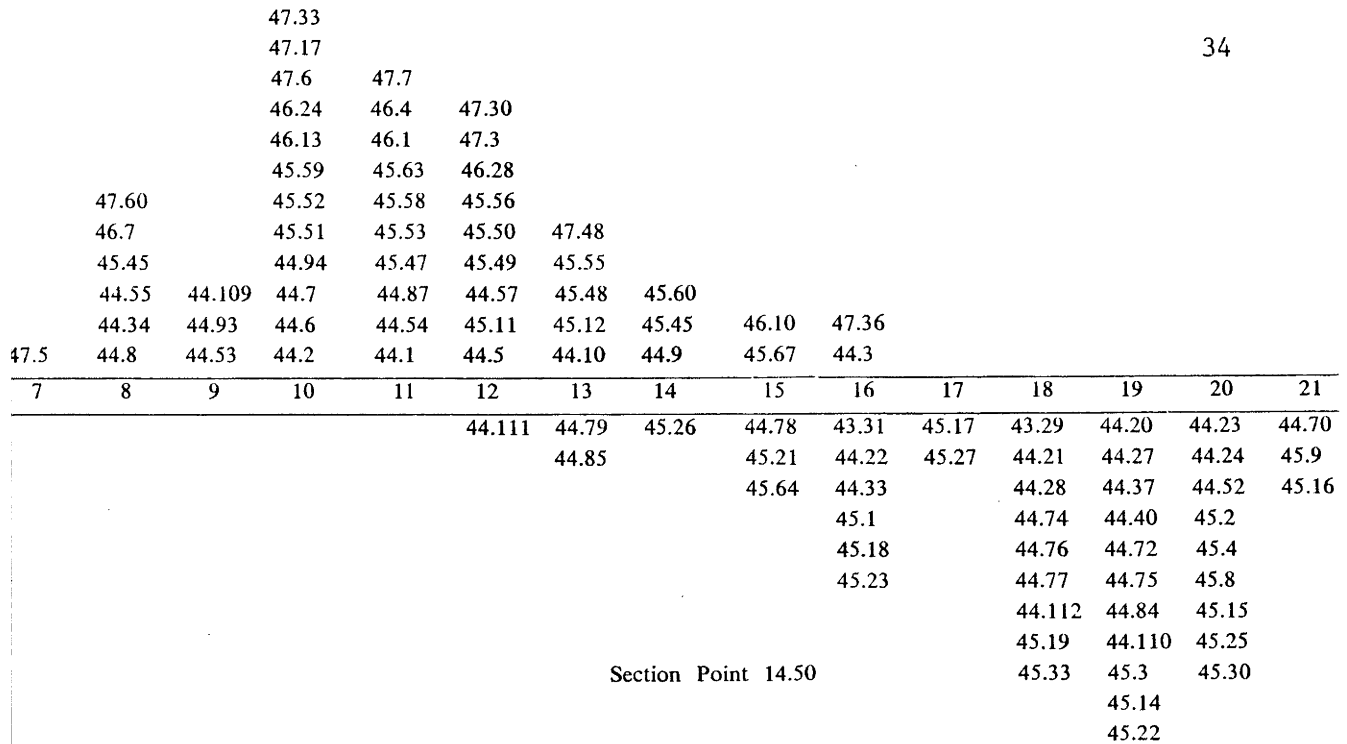


Figure 1. Larnach and Freedman sexing score distribution for Aboriginal crania from the Murray River Valley.

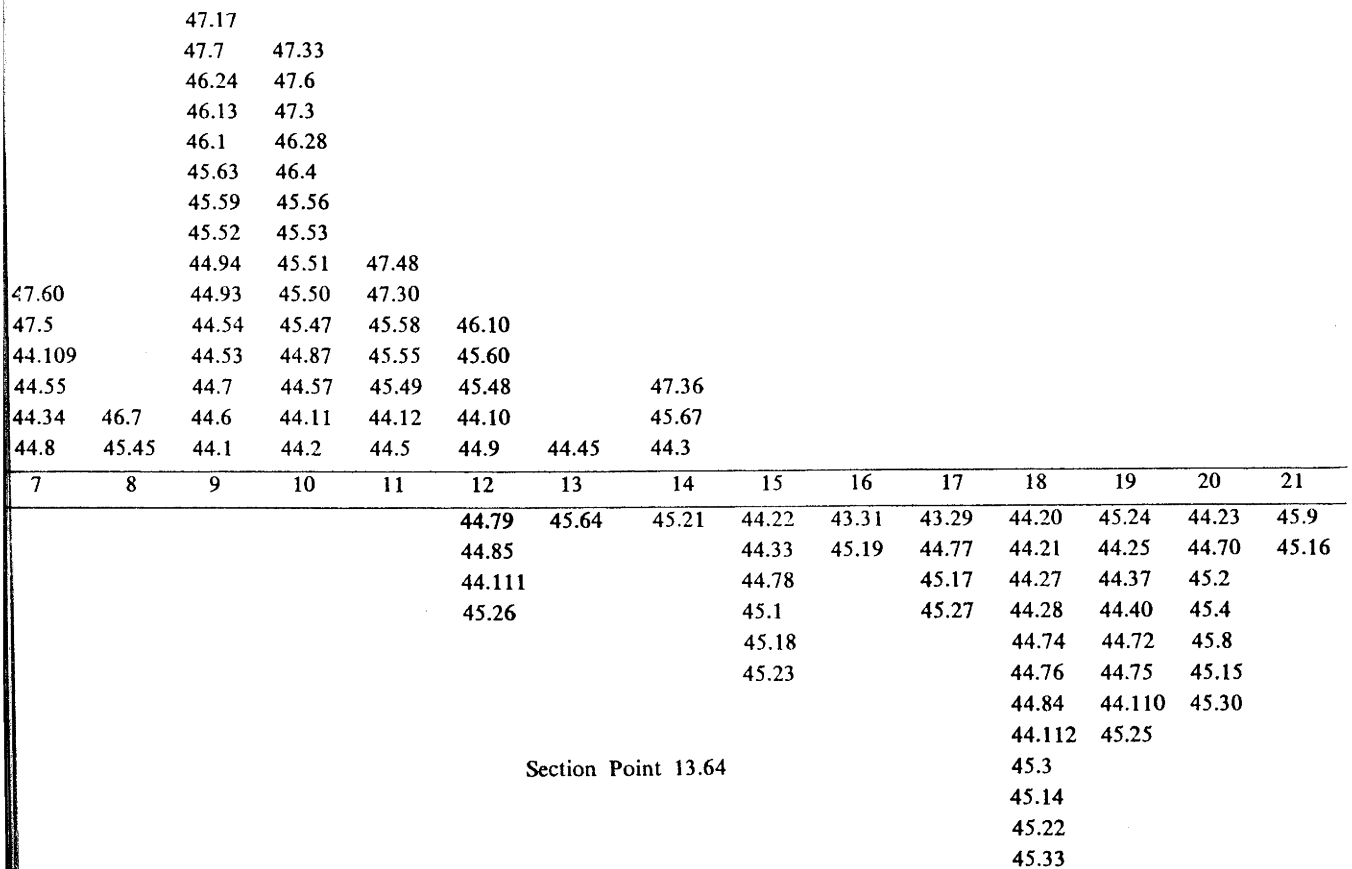


Figure 2. Distribution of the crania in Figure 1 using the recalculated class 2 limits for palate and mastoid size.

overlap between the male and female sex scores (12-14) was reduced and contained only 15 percent of the total crania. The section point of 13.6 correctly sexed 94.3 percent of the female crania and 89.4 percent of the males. Although demonstrating that the Larnach and Freedman technique could accurately sex Aboriginal crania, it is apparent that there is some regional variation in the development of the sexing characters, most notably palate and mastoid size. This remains a problem for material stemming from areas other than the Murray River Valley.

2. Discriminant Function Analysis

The development of linear discriminant function analysis began in the 1930's and has its roots planted firmly in the developmental work of Fisher (1936). The classic problem in discriminant analysis is to assign an unknown subject to one of two or more groups on the basis of a multivariate observation (Lachenbruch and Goldstein, 1979). This predictive and inferential technique has proved particularly useful for determining the sex of isolated bones of the human skeleton (Martin, 1936; Thieme and Schull, 1957; Hanihara, 1958,1959; Giles and Elliot, 1963; Giles, 1964; Kajanoja, 1966; Henke, 1974) and dentition (Ditch and Rose, 1972; Brown and Townsend, 1979).

The discriminant function for deciding between alternative hypotheses (populations) on the basis of the observed data is the logarithm of the likelihood ratio for two simple hypotheses given the observation (Welch, 1939). This discriminant function provides a sufficient reduction of data for drawing inferences on the two alternative hypotheses (Smith, 1947; Rao, 1966). The mathematical objective is to weight and linearly combine the discriminating variables so that the groups are forced to be as statistically distinct as

possible. These discriminant functions are of the form:

$$D_i = d_{i1}Z_1 + d_{i2}Z_2 + \dots + d_{ip}Z_p$$

where D is the score on discriminant function i , the d 's are the weighting coefficients, and the Z 's are the standardised values of the p discriminating variables used in the analysis (Nie *et al.*, 1975). The maximum number of functions which can be derived is either one less than the number of groups or equal to the number of discriminating variables. These functions maximise the separation of the groups. A detailed description of the mathematical basis of discriminant analysis can be found in Eisenbeis and Avery (1972) and Goldstein and Dillon (1978) with an excellent summary of recent work in this field in Lachenbruch and Goldstein (1979). As the mathematical basis to discriminant analysis is well established it will not be examined further here.

Of greater importance is an examination of the underlying assumptions of discriminant analysis and multivariate statistics in general (Eisenbeis and Avery, 1972; Corruccini, 1975; Goldstein and Dillon, 1978; Lachenbruch and Goldstein, 1979). Linear discriminant analysis assumes that:

1. The initial groups used in developing the rule are correctly classified and that the groups are discrete and identifiable.
2. Large sample size.
3. The observations have a multivariate normal distribution in each population.
4. Equality of variance.
5. Linearity and homogeneity of covariance.

As Corrucini in his classic cautionary paper on multivariate analysis correctly points out, 'the uniformity of input data to these conditions is not commonly documented or defended by researchers in physical anthropology' (1975:744). This is certainly the case with the majority of published accounts of sex determination using discriminant functions (Giles and Elliot, 1963; Giles, 1964; Kajanoja, 1966). As discriminant analysis will be used extensively in this analysis, these assumptions will be examined in detail.

Group classification

The basis for group membership was sex. Each cranium was sexed through its associated pelvis with only positive males and females included in the analysis (Brown, 1981a). Considerable care was taken with this and I do not believe that any individuals have been misclassified. There is still, however, an overlap in the male and female ranges in terms of cranial morphology and size, but it is not a prerequisite that each group is statistically unique. If this was the case discriminant analysis would find few applications in biological research.

A possible source of error is the lack of geographic and temporal control with the Murray Valley material. This was unavoidable. This collection was used precisely because it is the only large, regional series of crania with associated postcranial skeletons in Australia. The only two other populations with associated postcranial skeletons, Roonka and Broadbeach, are poorly preserved and not suitable for this type of analysis. Also, in the case of Broadbeach there are very few females ($n = 4$) in the sample.

Sample size

Formalised statements as to what constitutes a sufficiently large sample for purposes of discriminant analysis are few in the literature. Lachenbruch and Goldstein (1979) note this difficulty and observe as a general 'rule of thumb' that there should be three times as many observations as there are parameters to estimate in each group. This number will decrease for populations which are well separated and increase for those which are close together. In this case given the sex based dimorphism in Australian Aboriginal crania the sample of 53 female crania and 47 males appears adequate.

Multivariate normalcy

The classic assumption of multivariate normalcy is central to all multivariate analysis dependent on probability theory (Cooley and Lohnes, 1971; Corruccini, 1975). In spite of this there appears to be no consensus as to the robustness of multivariate statistics for non-normal distributions. Mardia (1971) and Blackith and Reyment (1971) suggest that distributional irregularities do not adversely influence statistical distances, but Vogt and McPherson (1972) disagree. This situation is complicated by the fact that there is no recognised test for comparing data with the multivariate normal distribution. 'The assumption must therefore be taken for granted either that most data are normal or, if otherwise that the statistics are not too badly affected' (Corruccini, 1975:3).

Some control on this can be obtained by limiting the number of observations recorded and by analysing their distribution in univariate space (Sokal and Rohlf, 1969). Suitable tests for departure from the normal

curve, for samples larger than 50, are provided by Skew ($\sqrt{b_1}$) and Kurtosis (b_2). For samples smaller than 50 there is a loss of sensitivity in $\sqrt{b_1}$ and b_2 due to the necessity of grouping together small tail frequencies when applying the tests. A more powerful test for normality in samples smaller than 50 was developed by Shapiro and Wilk (1965) and this test will be employed here.

The Shapiro-Wilk test (W) is associated with a graphical procedure for testing whether a sample could have been drawn from a normal population. The test orders the sample scores on the variable and pairs these with similarly ordered scores from a standard normal distribution. The W statistic is the squared correlation between the paired scores. A correlation close to 1.0 implies normality, with W decreasing from 1 with increasing departure from normality (Gollan, 1982). Percentage points of the W distribution are given in Table 16 of Pearson and Hartley (1972). Through an examination of the plot associated with the Shapiro-Wilk statistic (program SHPWLK developed by Y. Pittelkow, Computer Services, ANU) the form of the distribution may be analysed. The Shapiro-Wilk statistic is calculated according to:

$$W = \frac{\sum_{i=1}^n a_{i,n} x_{(i)}^2}{\sum_{i=1}^n (x_i - \bar{x})^2}$$

(Pearson and Hartley, 1972)

Homogeneity of covariance

The performance of the linear discriminant function may be affected if the sample covariance matrices are unequal (Lachenbruch and Goldstein, 1979). It has been generally assumed in the anthropological literature that the discriminant function is robust to inequalities in covariance (Giles and Elliot, 1963; Giles, 1964; Kajanoja, 1966; Henke, 1974). Tests of

equality of the covariance matrices are not presented. The reason for this is that tests of dispersion homogeneity are powerful and almost always reject the hypothesis (Cooley and Lohnes, 1971). Even with extreme data reduction I have found that with comparisons of human crania it is not always possible to obtain equality of covariance between groups. However, through careful variable selection the sample covariance matrices may be made reasonably similar. It has been demonstrated that the performance of the linear discriminant function is satisfactory if the covariance matrices are not too different (Gilbert, 1969; Marks and Dunn, 1974).

It should be remembered that irregularities in covariance matrices between populations may be of biological significance. The researcher must choose between satisfying the statistical assumptions of a particular technique and perhaps compromising the biological information that may be recovered from the analysis. In this case, as I was interested only in classification, particular emphasis was placed on homogeneity of covariance.

Variable selection

The major problem with the published methods of sex determination using discriminant functions is that through the choice of variables they require undamaged crania. Undamaged crania, especially those with complete preservation of the zygomatic arches, are often elusive in museum collections. This was the initial factor governing variable selection for this analysis. Three separate approaches were taken to provide discriminant functions suitable for sexing crania with varying degrees of preservation.

Function 1: Crania complete but with damage to the zygomatic arches.

Variable list: maximum bi-parietal breadth, glabella-opisthocranion, basion-bregma, basion-nasion, maximum supraorbital breadth, nasion-nasospinale, alveolar length and mastoid depth.

Function 2: Cranial base and zygomatic arches damaged, with basion and opisthion not preserved. Variable list: maximum bi-parietal breadth, glabella-opisthocranion, maximum supraorbital breadth, auriculare-bregma, nasion-nasospinale, alveolar length and mastoid depth.

Function 3: Face absent, baso-occipital area damaged and mastoid processes incomplete, suitable for material consisting only of a fragmentary vault. Variable list: maximum bi-parietal breadth, maximum supraorbital breadth, auriculare-bregma, auriculare-glabella, auriculare-lambda, auriculare-asterion and glabella-bregma.

A series of separate discriminant runs, each with eight variables was prepared. Variables were selected where there was a significant difference between the male and female means ($P = .001-.000$) and no significant difference in variance (Table 1). For Function 1 (complete crania) the distribution of each variable was compared to the normal curve using the Shapiro-Wilk statistic (W). Using the significance tables provided in Pearson and Hartley (1972, Table 16) values of W at the 1 percent level were considered to show significant deviation from the normal distribution and were rejected. With Functions 2 and 3 the restricted number of variables available required the inclusion of some variables with non-normal distributions. Deviations from the normal distribution were found to be common in those variables sharing auriculare as a base point, especially in the female sample.

Table 1. Descriptive statistics for the variables included in the discriminant function analysis of male and female crania from the Murray River Valley.

VARIABLE	FUNCTION		n	\bar{X}	s	W	P	F	P	T	P
Max. Bi-Parietal breadth	1,2,3	♂	47	130.5	4.52	0.978	0.10				
		♀	53	127.2	4.70	0.973	0.10	1.08	0.792	3.52	0.001
Glabella-Opisthocranium	1,2	♂	47	189.1	5.75	0.962	0.10				
		♀	52	179.8	5.02	0.979	0.50	1.31	0.341	8.55	0.000
Basion-Bregma	1	♂	45	133.4	4.04	0.972	0.10				
		♀	50	126.3	4.38	0.966	0.10	1.17	0.596	8.23	0.000
Basion-Nasion	1	♂	45	102.4	3.28	0.956	0.10				
		♀	50	96.2	3.92	0.951	0.05	1.43	0.233	8.33	0.000
Glabella-Bregma	3	♂	47	109.9	4.38	0.963	0.10				
		♀	53	102.9	3.99	0.961	0.10	1.20	0.517	8.33	0.000
Supra Orbital breadth	1,2,3	♂	47	108.5	3.48	0.957	0.10				
		♀	53	105.2	4.12	0.983	0.50	1.41	0.241	4.29	0.000
Lambda-Bregma	3	♂	46	117.3	5.04	0.969	0.10				
		♀	53	112.3	4.79	0.951	0.05	1.11	0.716	5.12	0.000
Auriculare-Bregma	2,3	♂	47	123.4	4.01	0.980	0.50				
		♀	53	117.8	3.88	0.934	0.01*	1.07	0.816	7.04	0.000
Auriculare-Glabella	3	♂	47	118.3	4.19	0.939	0.02				
		♀	53	112.5	4.08	0.944	0.02	1.05	0.850	6.91	0.000
Auriculare-Nasion	2	♂	47	111.9	4.30	0.928	0.01*				
		♀	53	106.5	3.77	0.954	0.05	1.30	0.356	6.69	0.000
Auriculare-Lambda	3	♂	47	116.2	3.63	0.964	0.10				
		♀	53	111.7	3.34	0.971	0.10	1.18	0.568	6.42	0.000
Auriculare-Asterion	3	♂	47	101.8	3.81	0.947	0.05				
		♀	52	95.1	4.97	0.927	<0.01*	1.70	0.070	7.44	0.000
Nasion-Nasospinale	1,2	♂	47	49.9	2.66	0.968	0.10				
		♀	53	47.3	2.54	0.952	0.05	1.09	0.750	4.92	0.000
Alveolar length	1,2	♂	47	64.1	3.98	0.970	0.10				
		♀	53	59.3	3.24	0.970	0.10	1.50	0.155	6.65	0.000
Mastoid depth	1,2	♂	47	31.2	2.35	0.954	0.10				
		♀	53	27.1	2.08	0.944	0.05	1.28	0.394	9.13	0.000

* Significant deviation from normal curve

Originally a large series of variables using basion as a reference point was duplicated using auriculare, specifically to provide comparative data for damaged crania. Even given these irregularities in distribution I would still choose to use auriculare due to its high frequency of preservation in damaged crania and the high correlation between measurements using basion and those using auriculare.

Linear Discriminant Functions were calculated using the SPSS package DISCRIMINANT (Nie, *et al.*, 1975). A stepwise variable selection procedure was employed to select the major discriminating variables and indicate any redundancy. A variable was considered for selection only if its partial multivariate F ratio was larger than a specified value. The partial F ratio measures the discrimination introduced by the variable after taking into account the discrimination achieved by the other selected variables. If the partial F is too small the variable is rejected. This stepwise procedure results in the optimal set of discriminating variables (Nie *et al.*, 1975:448). The stepwise procedure chosen was method MAHAL which maximised the Mahalanobis distance between groups. Covariance matrices were produced for each group and a test for equality of the matrices, Box's M (Box, 1949), and its associated F test employed. Probabilities of misclassification, plots of the discriminant scores, eigenvalues and Wilks Lambda were examined for each function.

Results

Covariance matrices were calculated for the male and female samples in each of the three discriminant runs. In each case the F ratio associated with Box's M is not significant at the .05 level and it is reasonable to

assume that the dispersion in the male and female groups in each discriminant run is equal (Table 2).

TABLE 2: Test of equality of group covariance matrices using Box's M.

	Box's M	F	degrees of freedom		P
Function 1	0.24945	0.81604	28,	27344.7	0.7405
Function 2	0.22313	0.98979	21,	32013.1	0.4717
Function 3	0.17902	1.12300	15,	31982.0	0.3282

Function 1: The stepwise selection procedure included seven of the initial eight variables in the final function. Basion-nasion length was excluded as it did not increase the discriminatory power of the other seven variables. The standardised coefficients (Table 3) indicate that the major contributor to the function is mastoid depth, followed by glabella-opisthocranion length and basion-bregma height. Previously, Larnach and Freedman (1964) found that the size of the mastoid process was an excellent single indicator of sex in Australian Aboriginal crania. In a trial series of discriminant analyses the exclusion of mastoid depth from the variable list resulted in a 5-10 percent reduction in the discriminatory power of the final function in every case. The canonical function associated with discriminant function 1 indicates a high correlation between the function and the variables which define group membership (Table 4).

Table 3. Standardised discriminant function coefficients, means, section points and classification percentages for functions 1-3.

Discriminant function number	1	2	3
Number of variables	7	6	5
Max. Bi-Parietal breadth	.14833		
Glabella-Opisthocranion	.46164	-.33843	
Basion-Bregma	.45796		
Glabella-Bregma			-.73539
Max. Supraorbital breadth	-.25117	.18591	
Lambda-Bregma			-.32303
Auriculare-Bregma		-.34463	-.32539
Auriculare-Glabella			.23788
Auriculare-Asterion			-.2216
Nasion-Nasospinale	.20003	-.29964	
Alveolar breadth	.32041	-.31681	
Mastoid depth	.53185	-.63635	
Male mean	187.4	-141.6	-142.2
Male range	178-195	134-149	131-156
Male classification %	90.0	89.4	84.1
Female mean	176.2	-132.2	-133.5
Female range	169-184	125-140	123-140
Female classification %	95.7	92.3	88.7
section point	181.8	-136.9	-137.8
total classification %	93.4	90.9	86.6

TABLE 4: Eigenvalues, canonical correlations and Wilks Lambda
for the three discriminant functions.

	Eigenvalue	% variance	canonical correlation	Wilk's Lambda	Chi- squared	d.f.	P
Function 1	2.30981	100.0	0.8353850	0.3021319	102.33	7	.0000
Function 2	1.93614	100.0	0.8120451	0.3405827	98.016	6	.0000
Function 3	1.06530	100.0	0.7181987	0.4841906	64.912	5	.0000

The converted discriminant function scores (produced by multiplying the raw data for each variable with the standardised coefficients) are plotted in Figure 3. The distribution is not particularly bimodal but this may improve with a larger sample. Henke (1974) obtained a multi-modal distribution in his discriminant analysis of a large series of known sex crania. The section point accurately predicted the group membership of 90.9 percent of the male crania and 95.7 percent of the females with an overall accuracy of 93.4 percent. This compares extremely favourably with other cranial sexing techniques.

Function 2: Six of the initial eight variables were selected by the analysis for inclusion in Function 2. Bi-parietal breadth and auriculare-nasion length were considered redundant. The standardised coefficients indicate that mastoid depth has contributed about twice as much to the discriminating power of the function as the other five variables (Table 3). Similarly to Function 1 this function has a high canonical correlation and significant Wilks Lambda.

This function was slightly less successful at predicting group membership than Function 1. The section point accurately classified 89.4 percent of the male crania and 92.3 percent of the females with a total

MURRAY VALLEY ♀ n=47

\bar{x} 176.28
s 3.50
Range 168-184

91	169
87	170
75	171
64	172
93	173
84	174
86	175
67	176
55	177
70	178
48	179
54	180
57	181
73	182
59	183
	184
	185
	186
	187
	188
	189
	190
	191
	192
	193
	194
	195

SECTION POINT
181.87

MURRAY VALLEY ♂ n=44
 \bar{x} 187.46
s 4.40
Range 178-195

Figure 3. Distribution of the male and female crania from the Murray River Valley using discriminant function 1.

accuracy of 90.9 percent. The lower success rate of Function 2 is also indicated by the smaller eigenvalue associated with the function. However, the accuracy of Function 2 is still equal to that obtained by other metrical techniques and has the advantage of being applicable to Aboriginal crania with a damaged basi-occipital area.

Function 3: This function was developed specifically to sex fragmentary cranial material and due to the reduced number of variables available an especially high prediction level was not expected. Of the initial eight variables three were rejected by the stepwise procedure as contributing little to the discriminatory power of the final function. The variables excluded from the analysis were maximum bi-parietal breadth, maximum supraorbital breadth and auriculare-lambda. The exclusion of bi-parietal breadth and supraorbital breadth from the function is fortuitous as this function can now be used on crania which are missing one complete side of the vault. The standardised coefficients indicate that the variable glabella-bregma was the major contributor to the function, with the remaining four variables being much less important (Table 3).

Function 3 accurately predicted the sex of 84.1 percent of the male crania and 88.7 percent of the females, with an overall accuracy of 86.6 percent. Relative to other sexing techniques this level of accuracy is still acceptable. The reduced discriminatory power of Function 3 is indicated by its lower eigenvalue and canonical correlation compared to the other two functions (Table 4). Wilks Lambda and its associated chi-square value are still significant.

SWANPORT ♀ n=21

\bar{x} 173.72

s 5.03

Range 165-182

72	100	73	53	116	55	84	85	49	92	63*																		
						46*	43	47	90*	89* 41																		
165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180	181	182	183	184	185	186	187	188	189	190	191	192	193
												42		74	65	66	40	37	64	38	50	61*	126		98			99
														97	87	86	60	62	96	96	101							
																	77	106										
																	91*											

SECTION POINT
178.57

SWANPORT ♂ n=23

\bar{x} 183.41

s 3.90

Range 177-193

Figure 5. Distribution of male and female crania from Swanport using discriminant function 1 developed from Murray Valley crania (*associated pelvis).

As an alternative means of sexing and to double-check the Larnach and Freedman sex scores the discriminant functions developed on the Murray Valley crania (Function 1) were applied to the Swanport crania (Figure 5). In Figure 5 individuals classified as female according to the Larnach and Freedman technique are plotted above the axis and males below. The discriminant results support those obtained in the Larnach and Freedman analysis. Two crania (Swanport 92 and 97) obtain intermediate scores with both techniques. Brown and Townsend (1979) found that canine size was a good discriminator between male and female Aboriginals. In this case the large maxillary canines of Swanport 97 (breadth 9.7mm) suggest it is male and the small dentition of Swanport 92 indicates it is female.

The smaller size of the Swanport crania relative to the Murray Valley sample is reflected in the distribution of the discriminant function scores. The Swanport section point (178.57) is lower than that in the Murray Valley sample (181.87) as are the male and female mean scores. Due to the regional variation in Australian Aboriginal crania I think it is unlikely that any one sexing technique will ever achieve an accuracy greater than 85-90 percent in continent-wide applications. In this case the close agreement between the two techniques suggests an accuracy of around 90 percent. Twenty-five female crania and 23 males were indicated by the analysis.

Coobool creek

None of the Coobool crania used in this analysis has associated postcranial skeletons complete enough for a positive identification of sex. Sex determination is possible only through an examination of the crania.

This is complicated by temporal factors, most notably their large size, and the presence of artificial deformation (Brown, 1981b). As a result it is probable that the application of discriminant functions developed on a known sex modern Aboriginal series would produce erroneous results. Fortunately Thorne (1975) found that in the Kow Swamp crania the development of the five morphological sexing characters used by Larnach and Freedman was within the modern range. There is presently no evidence of temporal variation in these features.

The Coobool crania were sexed using the modified form of the Larnach and Freedman (1964) technique with the increased class 2 limits for palate and mastoid size (Brown, 1981a). The palates and mastoid processes in the Coobool crania are extremely large, in some crania exceeding the recorded Australian range. Table 5 lists the raw scores for the five morphological sexing characters and the two modules in the Coobool sample. Even using the increased class 2 limits no crania were found to have class 1 mastoid processes and only two have class 1 palates. However, the five morphological characters were all well within the modern range of development. Two features (glabella prominence and the size of the occipital muscle markings) were generally not prominent and this may balance the high scores achieved for the two modules. The section point developed using the modified Larnach and Freedman technique on Murray Valley crania was applied to the Coobool series, individuals scoring greater than 13 were classed as male and those scoring less than 14 as female (Figure 6).

Table 5

Raw scores for the seven Larnach and Freedman (1964) sexing characters in the Coobool Creek crania

Specimen No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	1	1	2	1	-	1	1	7	9	-	20	12	-	57	65	37
2	2	1	1	1	3	2	3	13	13	31	24	16	119	70	67	47
5	3	2	3	1	3	2	-	14	16	34	29	22	217	-	-	-
7	1	1	1	1	3	2	1	10	10	28	27	15	113	59	65	38
8	2	3	2	-	3	3	-	13	17	28	25	16	112	-	-	-
9	2	1	2	1	2	1	2	11	11	30	22	15	99	60	70	42
10	2	1	2	3	3	1	-	12	14	28	28	23	180	-	-	-
12	2	2	3	1	2	1	2	13	13	28	21	17	117	60	66	40
13	3	2	3	2	3	1	3	17	17	30	23	15	103	63	73	46
16	2	3	3	3	3	3	3	20	20	32	22	20	141	68	74	50
18	2	2	1	2	2	1	2	12	12	29	25	13	94	61	65	40
28	2	2	3	1	3	3	3	17	17	29	24	19	132	69	76	52
29	2	1	3	3	3	1	3	16	16	34	26	18	159	61	71	43
35	3	3	3	-	3	2	-	14	18	37	29	18	193	-	-	-
36	3	3	2	3	3	3	3	20	20	30	27	15	122	65	74	48
37	2	3	3	3	3	3	3	20	20	31	26	19	153	66	72	48
40	-	-	-	2	-	-	3	-	-	-	-	-	-	64	75	48
41	2	2	3	2	3	3	3	18	18	35	24	15	126	63	73	46
45	2	3	2	2	2	3	3	17	17	30	23	15	104	67	67	45
46	3	3	-	3	3	2	3	17	19	33	25	15	123	68	75	51
49	2	2	3	2	3	2	3	17	17	36	26	18	168	66	72	48
50	2	1	3	1	2	1	3	13	13	26	25	14	91	61	72	44
65	3	2	3	3	3	2	3	19	19	30	25	16	120	62	73	45
66	2	2	3	3	2	1	2	15	15	27	22	16	95	61	68	41
71	3	2	3	2	3	3	3	19	19	32	26	17	141	66	83	55

1. Glabella prominence
2. Superciliary Ridge prominence
3. Zygomatic Trigone development
4. Malar Tuberosity size
5. Mastoid size
6. Occipital markings
7. Palate size
8. Sex score

9. Sex score plus missing values
10. Mastoid length
11. Mastoid width
12. Mastoid depth
13. Mastoid module (L.W.D/100)
14. Alveolar length
15. Alveolar breadth
16. Palate module (L.B/100)

														Female n=7	
														$\bar{X}=11.6$	
														s= 1.62	
					50										
					12										
1	7	9	18	2											
<hr/>															
7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	
<hr/>															
								10	66	5	8	35	46	16	
										29	13	41	65	36	
											28	71	37		
											45				
											49				
					Males n=17										
					$\bar{X}=17.6$										
					s= 1.77										

Figure 6. Modified Larnach and Freedman sexing score distribution for the Coobool Creek crania.

Although spurious results were expected, the discriminant functions (Function1) developed on the Murray Valley crania were applied to the Coobool series. In Figure 7 individuals classed as female according to the Larnach and Freedman analysis are plotted above the axis and males below. The large size of the Coobool crania results in discriminant scores which for six crania exceed the Murray Valley maximum score of 195. The discriminant scores heighten the difficulty in the application of discriminant functions where there is both temporal and regional variation in morphology. However the discriminant scores do generally support those obtained from the Larnach and Freedman analysis. Coobool crania 2 scoring 13 in the Larnach and Freedman analysis gains a high discriminant score of 195. This score is the maximum obtained in the Murray Valley sample and would classify it as a definite male in that population. An examination of the Larnach and Freedman raw scores for this cranium (Table 5) indicates that it is a definite female with minimum scores for the five morphological sexing characters. The large size of this cranium results in maximum scores for palate and mastoid size and a high discriminant score. This cranium is definitely female.

COOBOOL CREEK ♀ n=5

\bar{X} 185.69

s 7.23

Range 178-195

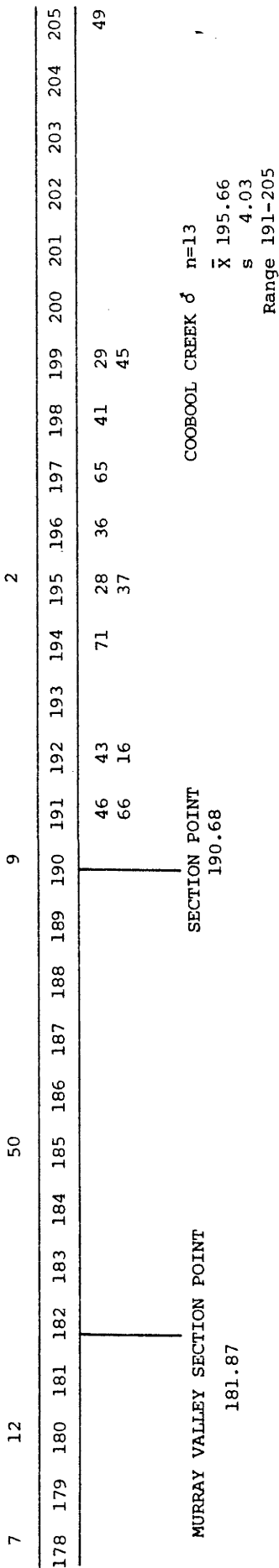


Figure 7. Distribution of the male and female crania from Coobool Creek using discriminant function 1 developed from Murray Valley crania.

Two individuals (Coobool Creek 40 an isolated face and mandible and Coobool Creek 32 a fragmentary mandible) could not be sexed by either of these techniques. Coobool Creek 32 is a massive deep mandible with an extremely large dentition (canine breadth 10.1 mm) and is a positive male (Plate 42). The isolated face and mandible (CC 40), while relatively gracile in respect to the Coobool Creek male faces and mandibles, is at the top of the Coobool Creek male size range. Alveolar breadth is an excellent indicator of sex in Australian Aboriginal crania (Larnach and Freedman 1964; Brown 1981a) and the great alveolar breadth of this specimen (75 mm) suggests it is male. A total of seven females and 19 males was indicated by this analysis and forms the sample. Although I am confident of the accuracy of the sex determinations it is possible that due to the large size of the crania (especially palate and mastoid size) a female has been classified as male.

Kow Swamp and Cohuna

The postcranial skeletons associated with the Kow Swamp crania are poorly preserved and generally inadequate for purposes of sex identification. Thorne (1975) sexed the Kow Swamp crania using the Larnach and Freedman (1964) technique with supportive information from the postcranial skeletons where available. Of the five Kow Swamp individuals included in this analysis Thorne (1975) has sexed four (KS1,5,7 and 15) as male with the fifth (KS 2) a juvenile female. These determinations are as accurate as the material allows and will be followed here.

There is no postcranial material associated with the Cohuna cranium. The Cohuna cranium is large and robust with maximum development of the five Larnach and Freedman sexing characters which are preserved (the occipital area and mastoid processes are damaged). This cranium has a sexing score of 15 for the five characters preserved and is therefore male.

Broadbeach and Roonka

The cranial material used from both these sites was sexed through their associated postcranial skeletons. The Ischium-Pubis Index, depth and width of the greater sciatic notch and breadth of the acetabulum, as defined by Davivongs (1963a), were examined. Several of the Broadbeach innominates are damaged and sex determinations depended on the size and morphology of the greater sciatic notch and, following Davivongs (1963b), an examination of the associated femora. Fourteen male crania and four female crania form the Broadbeach sample. All of the seven Roonka crania included in this analysis are male.

SECTION 3

THE COOBOOL CREEK MANDIBLES3.1 Univariate and morphological comparison.

Published descriptions of the discrete and continuous morphological features in Australian Aboriginal mandibles are limited to those of Klaatsch (1908) and Larnach and Macintosh (1971), with Murphy (1957) describing the symphyseal region. Thorne (1975) presents a detailed morphological description of the Kow Swamp mandibles. For purposes of morphological description I have relied heavily on Larnach and Macintosh's work. Larnach and Macintosh are able to grade the continuous features they describe by reference to standards of their own construction. I found the grading of continuous morphological features to be extremely subjective, and as I have no idea of their standards of reference, I have made no attempt to grade these features in the Coobool Creek mandibles for comparison with their data.

Alternatively, to gain some idea of the relative development of these continuous features in the Coobool Creek mandibles, I made continual reference to a series of 60 mandibles (30 male and 30 female) from Euston in the Murray River Valley. These mandibles and their associated crania form part of the Murray Black collection in the Australian Institute of Anatomy, Canberra. The Coobool Creek mandibles were also compared with those from Kow Swamp (Thorne, 1975). Morphological comparisons were not possible between the Coobool Creek mandibles and those in the Murray Valley (Melbourne Anatomy), Swanport (South Australian Museum) and Broadbeach

(Queensland Anatomy) series as these mandibles were not available in Canberra for comparative purposes.

Metrical comparisons are made between the Coobool Creek mandibles and those from the Murray Valley, Swanport, Broadbeach and Kow Swamp, using the variables described in Section 1. Student's *t* is used to assess the significance of differences in the sample means and Snedecor's *F* value differences in variance. Where there is a statistical significance in variance, *t* is calculated using the formula based on a separate variance estimate (Nie, *et al.* 1975:270). Data are compared to the normal distribution using the Shapiro-Wilk statistic (*W*). Coefficients of variation ($CV = s \times 100/\bar{X}$) and standard errors of measurement ($SE = s/\sqrt{n}$) were calculated for all variables. The descriptive and comparative statistical data for the Coobool Creek, Murray Valley, Swanport and Broadbeach samples are presented in Tables 9-21. Lateral, frontal and occlusal views of the reconstructed Coobool Creek mandibles can be found in Plates 1-32.

The mandibular corpus

The dominating feature of the symphyseal region in the Coobool Creek mandibles is their great symphyseal height. The male mean is significantly greater ($P = .001 - .000$) than that in the comparative series from Swanport, Broadbeach and the Murray Valley. The maximum figure for symphyseal height (45 mm in CC16) equals the maximum recorded by Hrdlička (1928) for Australian Aboriginal mandibles. Similarly the Coobool Creek female mean is significantly greater ($P = .016 - .000$) than that in the comparative series, with the maximum (42 mm in CC2) exceeding Hrdlička's female maximum (39.5 mm). Although there are significant differences between the male and female mean figures for symphyseal height in the Murray Valley, Broadbeach and Swanport series, the difference between the male and female means at

Coobool Creek is not significant ($P = .168$). Thorne (1975) found that the Kow Swamp mandibles had a symphyseal height that was significantly greater than his 'modern' reference series. The difference between the male means at Coobool Creek ($n = 14$, $\bar{X} 39.1$, $s 2.62$) and Kow Swamp ($n = 5$, $\bar{X} 38.0$, $s 1.22$, Thorne 1975) is not significant.

Murphy (1959, 1968) drew attention to the compensatory deposition of alveolar bone in the symphyseal region as a response to dental attrition and decreasing facial height. This results in an increase in symphyseal height with age. The two Coobool Creek mandibles with the greatest symphyseal height (CC28 and CC16) have only a moderate degree of anterior tooth wear but such wear in the Coobool Creek and Kow Swamp dentitions is generally relatively high. While it is possible that compensatory deposition of alveolar bone in these populations is more rapid than in other areas, the increased height of the corpus in the Coobool Creek mandibles is not confined to the alveolar segment but is evenly distributed between the alveolar and basal areas of the symphysis.

The most prominent feature on the anterior surface of the symphysis is the mental trigone which Larnach and Macintosh (1971:9) define as a 'triangular eminence with its base directed downwards and situated anteriorly across the lower half, or two thirds, of the symphysis'. As Thorne (1975) noted, the apparent development of the trigone depends on the morphology of the surrounding structures. In mandibles with marked incurvature above the trigone, the trigone appears prominent although it may not be especially large. The size and morphology of the trigone varies considerably in the Coobool Creek and Euston mandibles. In CC49 the trigone is large and continuous towards a jutting inferior border, extending laterally into well developed lateral tubercles. In this specimen the impression of size is

heightened by the marked incurvature between the trigone and the alveolar ridge. Small low trigones are present in CC28 and CC66. The degree of incurvature above the trigone has its maximum development in CC12 and CC49, while in CC46 and CC65 the symphyseal area is relatively flat with little incurvature.

Larnach and Macintosh (1971) present a three-grade classification of the chin. They consider this area negative if its most anterior point falls behind the anterior surface of the medial incisors, and positive if it falls in front. In 11 of the Coobool Creek mandibles the chin is negative (73.4%), two are neutral and in two individuals (CC29, CC49) the chin is positive (13.3%). Thorne (1975) found that the four Kow Swamp mandibles complete enough for assessment were all negative. Compared to Larnach and Macintosh's coastal N.S.W. sample there is a higher frequency of negative chins in the Euston and Coobool Creek series (Table 6).

TABLE 6: The Chin

	N.S.W.*	Euston	Coobool
Negative	37.9% (n=56)	79.2 (n=38)	73.4 (n=11)
Neutral	54.7% (n=81)	18.8 (n= 9)	13.3 (n= 2)
Positive	7.4% (n=11)	2.0 (n= 1)	13.3 (n= 2)

* Larnach and Macintosh 1971

The mean thickness of the Coobool Creek male symphyses, while greater than that in the three comparative series, is significant only when compared with the Swanport sample ($P = .000$). Variance in this dimension is high in the Coobool Creek series, with a significant F value ($P = .037$) when compared with the Murray Valley males. The Coobool Creek female symphyses are not significantly thicker than those at Swanport, Murray Valley and Broadbeach. The difference between the male and female means at Coobool

Creek is significant ($P = .002$), as it is also in the Murray Valley sample ($P = .000$). The maximum thickness of the Coobool Creek symphyses (20 mm in CC46) equals the maximum recorded in the comparative series (Murray Valley) and exceeds the maximum recorded at Kow Swamp, 19 mm in KS7 (Thorne 1975).

The posterior surface of the symphysis can be roughly divided into two portions, the areas above and below the superior transverse torus. Above the transverse torus is a large sloping plane, the alveolar plane. In the Coobool Creek and Euston samples this plane varies in depth, slope and curvature. Larnach and Macintosh grade this plane according to the degree of inclination. In the Coobool Creek series the slope of this area varies from nearly vertical in the aged individual CC10 to a marked backwards decline in CC46. The slope of this feature appears to be related to the thickness of the symphysis and development of the superior transverse torus. The thicker the symphysis, the greater the departure of the slope from the vertical. A slight transverse torus is present in CC45 with a moderate torus in CC66. Thorne (1975) records very slight tori in KS1 and KS5 with a moderate development in KS14.

The genial pit is a depression which may be present immediately above the genial spines. Shallow genial pits are present in CC1, CC12, CC16, CC29, CC40 and CC66. In three of these (CC1, CC16 and CC40) a small foramen, the *foramen supraspinosum* of Weidenreich (1936:85), lies at the base of the pit. In general the area surrounding the genial spines and the inferior border of the posterior surface of the symphysis are not well preserved in the Coobool Creek mandibles, with slight erosion removing the detail from this region. The genial spines in the Coobool Creek mandibles do not project as far as those in the Euston sample but the base of the spines is generally more robust.

The digastric fossae in the Euston series typically present deep, rugose areas with sharp raised borders. Preservation of this area in the Coobool Creek mandibles is poor. Compared to the Murray Valley series, the Coobool Creek digastric fossae appear moderate in size, with the exception of CC46 in which the fossae are marked. Thorne (1975) records all the Kow Swamp fossae as marked.

The most noticeable feature on the lateral surface of the corpus is the extremely well developed lateral prominence in most of the Coobool Creek mandibles. This feature has a maximum development in CC28 and CC49, exceeding the development in the Euston series. Larnach and Macintosh (1971) subdivide the lateral prominence, with the inferior portion called the posterior marginal tubercle. In the Coobool Creek mandibles the lateral prominence is often a pronounced rounded bulge extending continuously from the intertoral sulcus down to the inferior border of the corpus. However, a prominent marginal tubercle is present in CC40.

The maximum lateral extent of the prominence is usually located in the inferior half of the body, level with the interdental septum for the second and third molars. The development of the prominence has little influence on corpus thickness, which is measured anterior to its maximum development. The mean thickness of the mandibular corpus in the Coobool Creek male mandibles is significantly greater ($P = .023$) than that in the Murray Valley male sample. The Coobool Creek mean, while higher than that at Swanport and Broadbeach, is not significantly so. There is no significant difference between the Coobool Creek female mean and the female means at Swanport, Broadbeach and the Murray Valley. The maximum body thickness in the Coobool Creek mandibles (17 mm in CC13, CC28, CC65, CC40 and CC1) is exceeded by the maximum in the Swanport and Murray Valley

samples (18 mm). Thorne (1975) records a maximum body thickness at Kow Swamp of 20 mm (KS1 and KS14).

Running between the alveolar ridge medially and the lateral prominence is a furrow of varying development, the extramolar sulcus. This feature is extremely varied in the Coobool Creek and Euston mandibles and to some extent appears related to overall size. This furrow varies from broad and deep (CC49) to short and shallow (CC1) and is absent in the aged individual (CC10) displaying extensive posterior tooth loss and alveolar resorption.

Larnach and Macintosh (1971:5-6) found that the lateral prominence gives rise to two branches running antero-posteriorly along the lateral surface of the corpus, the superior and marginal lateral tori. Their results indicate that the occurrence of the superior torus is more common in Australian Aborigines than is the marginal torus. Similarly, in the Kow Swamp (Thorne, 1975) and Coobool Creek mandibles the superior branch is more pronounced. In both the Coobool Creek and Euston mandibles there is great variability in the development of these tori and the sulcus which runs between them. The intertoral sulcus is shallow to indistinct in the Coobool Creek mandibles.

The mental foramen was most often located under the interval between PM2 and M1 in Larnach and Macintosh's coastal New South Wales sample. Similar results were obtained with the Coobool and Euston mandibles, although the second highest frequency in the Euston sample was located under M1 rather than below PM2 (Table 7). A well developed double foramen is present bilaterally in CC16.

TABLE 7: Location of the mental foramen

	N.S.W.*	Euston	Coobool
PM1-PM2	1.5% (n= 2)	2.1% (n= 1)	-
PM2	37.0% (n=49)	14.6% (n= 7)	20.0% (n= 3)
PM2-M1	48.8% (n=65)	58.3% (n=28)	60.0% (n= 9)
M1	12.7% (n=17)	25.0% (n=12)	20.0% (n= 3)

*Larnach and Macintosh 1971

The mean height of the corpus in the Coobool Creek male and female samples is significantly greater ($P = .016 - .000$) than that in the Murray Valley, Broadbeach and Swanport samples. Great corpus height is one of the major distinguishing features of the Coobool Creek mandibles. The Kow Swamp mandibles have a mean corpus height ($n=6$, \bar{X} 33.2mm, s 3.37mm) that is significantly greater than the northern Victorian mean ($P = .05 - .01$, Thorne, 1975). There is no significant difference between mean male corpus height figures for Coobool Creek and Kow Swamp. However, the Coobool Creek maximum (38 mm in CC28) exceeds the maximum recorded at Kow Swamp (36 mm for KS5 and KS7, Thorne, 1975) and the maximum in the comparative series (36 mm for the Murray Valley sample). There are significant differences between the male and female means for corpus height in the Coobool Creek sample ($P = .041$) and in the Murray Valley, Swanport and Broadbeach series ($P = .002 - .000$).

Medially the Coobool Creek corpora have mylohyoid ridges which are less prominent than those in the Euston sample. Marked mylohyoid ridges are present in only three of the Coobool Creek mandibles (CC32, CC40 and CC66). In the Euston mandibles the mylohyoid ridges typically have sharp, well defined mylohyoid lines below the molar region, from which the mylohyoid ridge drops away abruptly towards the submaxillary fossae. In the Coobool

Creek mandibles, as in KS5 and KS8 (Thorne, 1975), this region is represented by a low, smooth curve running downwards to the submaxillary fossae and the inferior border of the corpus. This morphology is found in nine of the Coobool Creek mandibles. Where an abrupt mylohyoid ridge is present it is located posteriorly, adjacent to the third molars.

Inferiorly the submaxillary and submandibular fossae are of varied development. The sublingual fossae in the Coobool Creek mandibles are generally shallow, relative to those in the Euston mandibles. Deep fossae are present in CC1, CC12, CC28 and CC40. The submaxillary fossae are more developed, with marked fossae in CC32, CC45, CC66 and CC71. Age-related changes in the Euston mandibles, with posterior tooth loss and alveolar resorption, result in great morphological change in the medial surface of the corpus, leading to loss of the mylohyoid ridge and the sublingual and submaxillary fossae (CC10).

Campbell (1925) and Larnach and Macintosh (1971) were unable to find a true mandibular torus in the Aboriginal mandibles they examined. The only example that I have observed in Australian Aboriginal mandibles is the large, tubular torus in a Tasmanian mandible from Eagle Hawk Neck (Tasmanian Museum, A EH2214). Although the alveolar region adjacent to the canines and premolars often presents a raised surface in the Euston and Coobool Creek mandibles, true mandibular tori are not present. There are no mandibular tori in the Kow Swamp mandibles (Thorne, 1975) and they were not evident in the mandibles from Roonka, Swanport, Broadbeach and the Murray Valley that I examined.

The mandibular ramus

The Coobool Creek rami give a superficial impression of fragility relative to the massiveness of the corpus. The rami are tall, vertical structures with high, arched coronoid processes which exceed the condyles in height. The mean height of the Coobool Creek male rami is significantly greater ($P = .003 - .002$) than the male means for the Murray Valley and Broadbeach samples. Similarly the Coobool Creek female mean is significantly greater ($P = .054 - .000$) than the female comparative series. In the Murray Valley sample the difference between the male and female means for ramus height is significant ($P = .000$) but there is not a significant degree of dimorphism for this dimension in the Coobool Creek, Swanport and Broadbeach groups. The maximum height of the Coobool Creek rami (69 mm for CC45) is equalled by the Swanport maximum. This is less than the maximum recorded for the Kow Swamp mandibles (70 mm for KS1, personal observation).

Although giving a visual impression of relative narrowness, the minimum breadth of the Coobool Creek male rami is actually significantly greater than the mean in the Murray Valley and Broadbeach samples ($P = .025 - .010$). The Coobool Creek and Swanport male rami have a similar mean minimum breadth. The mean minimum ramus breadth for the Coobool Creek female sample is not significantly greater than the means in the comparative series. The difference between the male and female means was found to be significant only in the Murray Valley series ($P = .000$). Thorne found that the mean minimum ramus breadth ($n=4$, \bar{X} 35.2mm, s 2.50mm) in the Kow Swamp males was not significantly greater than that in his northern Victorian comparative series ($n=72$, \bar{X} 34.2mm, s 3.69mm).

The mean maximum ramus breadth of the Coobool Creek males is significantly greater than the Murray Valley and Broadbeach male means ($P = .040 - .052$), with the Swanport mean being higher but not significantly different from that in the Murray Valley ($P = .065$). The Coobool Creek female sample for this dimension is extremely small ($n = 3$) and there are no significant differences between the maximum ramus breadths for these mandibles and the comparative rami. There is little sex-based dimorphism in this dimension, with no significant differences between the male and female means in the comparative sample. The maximum ramus breadth in the Coobool Creek series (52 mm for CC28) is exceeded by both the male and female maximums at Swanport (Swanport male maximum 60 mm and female maximum 57 mm). The maximum recorded ramus breadth for Kow Swamp is 51 mm for KS9 (Thorne, 1975).

The lateral surface of the ramus in the Coobool Creek mandibles is distinguished by large, often deeply depressed, masseteric fossae. The size and depth of the fossae are greater in the Coobool Creek male mandibles than in the females. In the males there is often marked eversion of the angle of the mandible, with the areas of attachment for the masseter muscles being extremely rugose. In CC28 and CC46 the depth and overall size of the masseteric fossae exceed the development in the Euston and Kow Swamp rami. In these two mandibles the inferior borders of the fossae are particularly thickened, raised areas, with well developed tubercles along the angle of the ramus. Larnach and Macintosh's (1971) data indicates that eversion of the angle of the mandible has a higher incidence in males (40.9%) than in females (3.5%). Similar results were obtained with the Coobool Creek and Euston mandibles. In contradiction to the general pattern for Coobool Creek, there is a slight inversion of the angle in two of the female mandibles (CC1 and CC9).

Subcondyloid tubercles were found on the lateral edge of the condyle in three of the 11 Coobool Creek mandibles in which this area is preserved. In two of these there are small bilateral tubercles and in the third (CC28) marked bilateral tubercles are present.

The mandibular condyles in the Coobool Creek mandibles are broad and narrow, with the mean maximum breadth of the male sample exceeding that in the Murray Valley males ($P = .002$). The Coobool Creek male mean is higher than that in the Swanport males but not significantly so ($P = .071$). Both the Coobool Creek and Broadbeach male mean maximum condyle breadths are similar. In the Kow Swamp mandibles the condyles are preserved in four individuals and they are also broad and narrow. Any specimen in which these dimensions were affected by the degenerative changes associated with arthritis were excluded from the sample.

Degenerative arthritis of the temporomandibular joint in Australian Aborigines is highly correlated with tooth wear and the increasing 'occlusal stress' that results from it (Richards and Brown 1981b). As Thorne (1975: 140) noted for Kow Swamp

Given the pronounced dental attrition evident in the KS1 and KS5 it is surprising that the condylar surfaces do not reveal any traces of flattening that might be expected as a consequence of the prolonged attritional forces involved.

Although attrition is marked in the majority of the Coobool Creek mandibles in which the condyles are preserved, degenerative changes in the surface of the condyle generally are slight. Using the grading system developed by Richards and Brown (1981b), three of the 10 Coobool Creek mandibles with condyles (CC28, CC49 and CC71) correspond to their class 0 (normal), with no evidence of degenerative changes either in the condyle or the temporal fossae. Four of the Coobool Creek mandibles (CC10, CC12, CC29 and

CC45) have slight localised erosion of the condylar and temporal surfaces (Richards and Brown's class 1). In two of these (CC10 and CC12) there is acute attrition with associated abcess development. In CC10 the teeth are reduced to maloccluded root stubs. The remaining three mandibles (CC13, CC46 and CC65) have more extensive degeneration, with greater plastic change in the temporal segment. These temporomandibular joints correspond with Richards and Brown's class 2 (localised proliferation). The degenerative changes in the Coobool Creek temporomandibular joints do not approach the condition evident in their classes 3 (generalised proliferation) and 4 (eburnation). Given the extreme attrition evident in the Coobool Creek dentitions, the temporomandibular joints show a surprisingly low level of degenerative arthritis. The great depth of the mandibular fossae in the Coobool Creek and Kow Swamp crania, plus the distance between the articular surfaces of the condyle and the fossae when the mandible is occluded, suggest that the articular cartilage may have been thicker in these individuals than in the Euston, Murray Valley and Swanport material I have examined. This may have helped reduce the stress on the temporomandibular joint resulting from progressive tooth wear and occlusal dysfunction.

Slightly below the medial edge of the condyle a small tubercle, the superior pterygoid tubercle, may be present. Larnach and Macintosh (1971) found this tubercle present as a trace in 8.1 percent and marked in 8.8 percent of their coastal New South Wales sample. Small tubercles are present in Coobool Creek mandibles CC12 and CC65.

The coronoid processes in the Coobool Creek mandibles are tall and broad with pronounced thickening along the anterior border. Where both coronoid processes and condyles are preserved, the coronoid process exceeds the condyle in height in all but one of the mandibles.

Measurement of the sigmoid notch was undertaken using the procedure defined by Larnach and Macintosh (1971). In the nine Coobool Creek mandibles where sigmoid notch depth can be measured three (CC1, CC28 and CC29) have sigmoid notches which are classed as 'deep'. In general it is the elongated coronoid processes that are responsible for generally deep notches in this series. The maximum depth of the sigmoid notch in the Euston sample is exceeded by the maximum in CC28 (16 mm) and CC29 (17 mm). Similar frequencies for the three size grades are found between Larnach and Macintosh's coastal New South Wales sample and the Euston series. There are too few in the Coobool Creek sample for meaningful comparison (Table 8).

TABLE 8: Depth of the sigmoid notch

	N.S.W.*	Euston	Coobool
<10 mm	23.3% (n=35)	27.7% (n=13)	-
10-13 mm	67.1% (n=94)	61.7% (n=29)	62.5 (n=5)
>13 mm	9.6% (n=13)	10.6% (n= 5)	37.5 (n=3)

*Larnach and Macintosh 1971

The posterior continuation of the alveolar margin, behind the third molar, runs into a marked thickening of the bone, the triangular torus. This torus, which bifurcates to form the endocondyloid crista posteriorly and the endocoronoid crista anteriorly, is the most prominent feature on the medial surface of the Euston and Coobool Creek rami. In the Coobool Creek rami the thickness of the ramus at the point at which the torus bifurcates is greater than that in the Euston rami, with a maximum thickness of 13 mm at this point in CC46 and CC49. The anterior branch of the triangular torus, the endocoronoid crest, is generally more pronounced than the posterior branch in the Coobool Creek series. There is, however, considerable

variation in the morphology of these crests in both the Euston and Coobool Creek material.

Lying immediately above the triangular torus is a flattish area of bone, the triangular plane, limited posteriorly and anteriorly by the endocondyloid and endocoronoid crests. The size of this feature is determined by the depth of the sigmoid notch, the breadth of the ramus and the morphology of the triangular torus. Relatively and absolutely large triangular planes are found in the Coobool Creek mandibles CC28, CC29, CC40, CC45 and CC46. Larnach and Macintosh (1971) describe this plane as being either flat or forming a shallow fossa. They found that fossae were more often present in female than in male mandibles. Slight fossae are evident in CC13, CC32, CC65 and CC66, with relatively deep fossae in CC40 and CC45. An unusual feature in CC32 and to a lesser extent in CC28 and CC65 is found in the anterior half of the fossa where there is a deeply depressed roughened area of tendinous insertion for the temporal muscle.

The fibres of the medial pterygoid are attached by strong tendinous laminae to the lower and posterior part of the medial surfaces of the ramus and the angle of the mandible. In the Coobool Creek mandibles this area is often extremely rugged and elevated, with a series of pronounced tubercles reaching from the edge of the ramus inwards and upwards to the mylohyoid groove and sulcus colli. The size of this area in the Coobool Creek male mandibles exceeds that in the Euston series, with CC28, CC46 and CC71 being particularly rugose.

One of the most distinctive features of the mandibles from Coobool Creek and Kow Swamp is their great posterior breadth. The mean bigonial breadth of the Coobool Creek male mandibles is significantly greater

($P = .000 - .008$) than that in the comparative male series. The maximum bigonial breadth of the Coobool Creek mandibles (122 mm for CC46) is considerably higher than the maximum recorded in the Murray Valley and Broadbeach samples (112 mm). The maximum bigonial breadth recorded for the Kow Swamp sample (127 mm for KS1, Thorne, 1975) is the maximum bigonial breadth recorded for Australian Aboriginal mandibles. Sexual dimorphism in this dimension is pronounced, with the difference between the male and female means in the Murray Valley and Swanport samples (the only two samples with a large female component) being significant ($P = .001 - .000$).

This great bigonial breadth is repeated to a lesser degree in the maximum breadth across the condyles in the Coobool Creek mandibles. The Coobool Creek male mean is significantly greater ($P = .004 - .003$) than the means for the comparative male series. The maximum bicondylar breadth in the Coobool Creek males (135 mm for CC28) exceeds the maximum recorded in the Murray Valley sample (132 mm) but is less than the Kow Swamp maximum, 136 mm for KS5 (Thorne, 1975). The difference between the male and female means for this dimension is significant ($P = .000$) in the Murray Valley and Swanport samples.

Anteriorly this great breadth is also found in the Coobool Creek mandibular dental arch, where the maximum dental arch breadth (71 mm for CC40) exceeds the maximum recorded at Kow Swamp (70 mm for KS1) and the Murray Valley maximum of 68 mm. The mean dental arch breadth in the Coobool Creek male sample is significantly greater ($P = .000$) than that in the comparative male samples. The difference between the male and female means for this dimension is significant only in the Murray Valley series ($P = .000$).

Although the Coobool Creek mandibles are extremely broad, they are not especially long. The mean mandibular length for the Coobool Creek males is not significantly greater than that for the Murray Valley and Broadbeach males ($P = .342 - .701$). The maximum length in the Coobool Creek (124 mm for CC49) and Kow Swamp mandibles (116 mm for KS1, Thorne, 1975) are exceeded by the Murray Valley and Broadbeach maximum (126 mm). The difference between the male and female means in the Murray Valley and Swanport samples is significant ($P = .009 - .000$).

Summary

The mandibles from Coobool Creek and Kow Swamp can be clearly distinguished both morphologically and metrically from the recent Australian Aboriginal mandibles from Broadbeach, Swanport and the Murray River Valley by the following features...

- great height in the corpus, both at the symphysis and posteriorly between the first and second molars.

- generally extreme development of the lateral prominence on the lateral surface of the corpus. Medially the mylohyoid ridge passes in a low smooth curve downwards to the submaxillary fossa and the inferior border, rather than dropping away abruptly below the mylohyoid line.

- the rami are tall and broad with high, robust coronoid processes which frequently exceed the condyles in height.

- large, deep masseteric fossae on the lateral surfaces of the rami, with marked eversion of the angles, especially in males. On the medial surface of the ramus is a large and rugose area of attachment for the medial pterygoids.

- broad and narrow mandibular condyles with little evidence of temporomandibular joint dysfunction.

- massive posterior breadth, both bigonial and bicondylar, with a broad dental arch. Individuals from these two populations exceed the modern Australian range for all these dimensions.

Table 9

Descriptive statistics for the Coobool Creek male and female mandibles (mm.)														
		n	\bar{X}	s	SE	CV	Min.	Max.	W	P	F	P	T	P
Symphyseal height	CC ♂	14	39.1	2.62	0.702	6.70	36.0	45.0	0.906	0.10				
	CC ♀	7	37.2	3.14	1.190	8.44	33.0	42.0	0.958	0.50	1.44	0.548	1.43	0.168
Symphyseal thickness	CC ♂	14	16.5	1.74	0.465	10.55	14.0	20.0	0.944	0.10				
	CC ♀	7	14.7	1.25	0.474	8.50	13.0	17.0	0.915	0.10	1.93	0.431	2.50	0.022
Corpus height	CC ♂	13	33.6	2.28	0.634	6.79	30.0	38.0	0.967	0.50				
	CC ♀	7	31.2	2.43	0.918	7.79	29.0	35.0	0.865	0.10	1.13	0.805	2.20	0.041
Corpus thickness	CC ♂	13	15.3	1.31	0.365	8.56	13.0	17.0	0.852	0.02				
	CC ♀	7	14.5	1.27	0.481	8.76	13.0	17.0	0.888	0.10	1.07	0.991	1.21	0.243
Bicondylar breadth	CC ♂	6	128.3	4.63	1.892	3.61	121.0	135.0	0.955	0.50				
	CC ♀	0	-	-	-	-	-	-	-	-	-	-	-	-
Bigonial breadth	CC ♂	9	110.5	7.63	2.545	6.90	101.0	122.0	0.918	0.10				
	CC ♀	1	87.0	-	-	-	-	-	-	-	-	-	-	-
Mandibular length	CC ♂	10	115.6	4.90	2.147	4.24	104.0	125.0	0.932	0.10				
	CC ♀	2	113.5	-	-	-	109.0	118.0	-	-	-	-	-	-
Ramus height	CC ♂	11	61.3	3.26	0.763	5.32	60.0	69.0	0.889	0.10				
	CC ♀	4	61.7	6.39	2.784	10.36	58.0	71.0	0.957	0.10	3.84	0.092	0.16	0.877
Max. Ramus breadth	CC ♂	10	47.3	3.74	1.138	7.91	43.0	54.0	0.934	0.10				
	CC ♀	3	46.6	2.08	1.202	4.46	45.0	49.0	0.923	0.10	3.23	0.517	0.27	0.789
Min. Ramus breadth	CC ♂	15	36.6	2.99	0.773	8.17	32.0	42.0	0.909	0.10				
	CC ♀	7	35.5	3.82	1.445	10.76	30.0	40.0	0.911	0.10	1.63	0.421	0.73	0.472
Condyle length	CC ♂	7	10.7	1.70	0.644	15.89	8.0	12.0	0.778	0.02				
	CC ♀	4	10.0	1.41	0.707	14.10	9.0	12.0	0.828	0.10	1.45	0.817	0.71	0.498
Condyle breadth	CC ♂	7	23.4	2.07	0.782	8.85	21.0	26.0	0.877	0.10				
	CC ♀	4	22.5	1.70	0.854	7.66	20.0	24.0	0.971	0.50	1.47	0.809	0.96	0.362
Dental arch breadth	CC ♂	10	66.7	3.16	1.001	4.74	61.0	71.0	0.935	0.10				
	CC ♀	3	59.6	2.51	1.453	4.21	57.0	62.0	0.987	0.50	1.58	0.893	3.50	0.005

Table 10
Descriptive statistics for the Murray Valley male and female mandibles (mm.)

		n	\bar{X}	s	SE	CV	Min.	Max.	W	P	F	P	T	P
Symphseal height	MV ♂	43	36.2	2.83	0.433	7.82	31.0	43.0	0.964	0.10				
	MV ♀	46	32.5	2.48	0.366	7.63	29.0	38.0	0.925	0.01	1.31	0.378	6.50	0.000
Symphseal thickness	MV ♂	44	15.8	1.14	0.172	7.22	13.0	19.0	0.895	SIG				
	MV ♀	46	14.8	1.51	0.223	10.20	12.0	20.0	0.882	SIG	1.77	0.064	3.66	0.000
Corpus height	MV ♂	42	31.0	2.12	0.328	6.84	28.0	36.0	0.935	0.02				
	MV ♀	43	27.4	2.20	0.337	8.03	23.0	32.0	0.957	0.01	1.08	0.805	7.52	0.000
Corpus thickness	MV ♂	43	14.1	1.60	0.244	11.35	11.0	18.0	0.925	0.01				
	MV ♀	45	13.6	1.47	0.220	10.81	11.0	17.0	0.936	0.02	1.18	0.594	1.51	0.134
Bicondylar breadth	MV ♂	34	120.1	6.12	1.051	5.10	108.0	132.0	0.946	0.10				
	MV ♀	37	112.8	5.91	0.972	5.24	96.0	128.0	0.972	0.50	1.07	0.835	5.08	0.000
Bigonial breadth	MV ♂	38	98.6	7.21	1.170	7.31	81.0	112.0	0.979	0.50				
	MV ♀	44	91.9	6.40	0.965	6.96	74.0	103.0	0.971	0.50	1.27	0.447	4.48	0.000
Mandibular length	MV ♂	43	113.7	5.46	0.833	4.80	104.0	126.0	0.965	0.10				
	MV ♀	46	106.3	6.08	0.897	5.72	82.0	117.0	0.964	0.10	1.24	0.484	6.02	0.000
Ramus height	MV ♂	43	56.4	4.84	0.738	8.58	46.0	66.0	0.965	0.10				
	MV ♀	47	50.6	3.60	0.526	7.11	43.0	57.0	0.961	0.10	1.80	0.052	6.40*	0.000
Max. Ramus breadth	MV ♂	42	46.3	2.71	0.419	5.85	41.0	51.0	0.951	0.10				
	MV ♀	46	45.5	2.79	0.412	6.13	41.0	53.0	0.949	0.05	1.06	0.851	1.35	0.182
Min. Ramus breadth	MV ♂	44	34.8	2.47	0.373	7.10	28.0	41.0	0.982	0.50				
	MV ♀	47	32.4	2.12	0.310	6.56	28.0	37.0	0.967	0.10	1.36	0.312	4.96	0.000
Condyle length	MV ♂	38	9.6	0.94	0.153	9.79	8.0	12.0	0.899	SIG				
	MV ♀	40	9.5	1.10	0.175	11.67	7.0	13.0	0.899	SIG	1.38	0.331	0.45	0.654
Condyle breadth	MV ♂	36	20.8	1.86	0.312	8.94	18.0	27.0	0.926	0.02				
	MV ♀	39	19.1	1.79	0.287	9.37	16.0	23.0	0.893	SIG	1.09	0.803	4.10	0.000
Dental arch breadth	MV ♂	38	61.5	3.14	0.510	5.11	54.0	68.0	0.962	0.10				
	MV ♀	40	58.6	2.55	0.404	4.35	55.0	67.0	0.917	SIG	1.51	0.205	4.37	0.000

*T calculated using separate variance estimate

Table 11
Descriptive statistics for the Swanport male and female mandibles (mm.)

		n	\bar{X}	s	SE	CV	Min.	Max.	W	P	F	P	T	P
Symphseal height	SW ♂	16	32.6	3.00	0.752	9.20	27.0	37.0	0.939	0.10				
	SW ♀	18	29.3	2.59	0.611	8.84	25.0	35.0	0.945	0.10	1.35	0.551	3.37	0.002
Symphseal thickness	SW ♂	16	14.3	1.08	0.272	7.55	13.0	16.0	0.880	0.02				
	SW ♀	18	14.1	1.29	0.305	9.15	12.0	17.0	0.932	0.10	1.42	0.503	0.50	0.617
Corpus height	SW ♂	16	27.6	2.65	0.663	9.60	22.0	33.0	0.962	0.50				
	SW ♀	17	25.0	1.47	0.358	5.88	23.0	28.0	0.939	0.10	3.22	0.026	3.49*	0.002
Corpus thickness	SW ♂	16	14.3	1.58	0.395	11.05	12.0	18.0	0.943	0.10				
	SW ♀	17	14.7	1.48	0.359	3.06	13.0	18.0	0.973	0.02	1.14	0.797	0.85	0.402
Bicondylar breadth	SW ♂	14	121.2	4.15	1.110	3.42	116.0	130.0	0.926	0.10				
	SW ♀	17	111.7	4.28	1.039	3.83	104.0	117.0	0.856	0.01	1.06	0.924	6.23	0.000
Bigonial breadth	SW ♂	14	101.6	4.21	1.127	4.14	94.0	108.0	0.949	0.50				
	SW ♀	17	93.8	6.44	1.563	6.87	80.0	103.0	0.915	0.10	2.33	0.129	3.90	0.001
Mandibular length	SW ♂	15	108.5	4.38	1.133	4.04	101.0	116.0	0.949	0.10				
	SW ♀	18	104.3	4.21	0.993	4.04	97.0	112.0	0.971	0.50	1.08	0.862	2.80	0.009
Ramus height	SW ♂	15	62.1	3.42	0.883	5.51	57.0	69.0	0.934	0.10				
	SW ♀	18	53.7	4.90	1.156	9.12	45.0	61.0	0.947	0.10	2.06	0.179	5.56	0.000
Max. Ramus breadth	SW ♂	15	51.7	4.36	1.127	8.43	46.0	60.0	0.926	0.10				
	SW ♀	18	49.2	3.33	0.786	6.77	43.0	57.0	0.965	0.50	1.71	0.290	1.87	0.071
Min. Ramus breadth	SW ♂	15	36.6	3.17	0.820	8.66	31.0	44.0	0.972	0.50				
	SW ♀	18	35.5	3.80	0.898	10.70	27.0	41.0	0.903	0.05	1.44	0.499	0.94	0.353
Condyle length	SW ♂	11	10.2	0.78	0.237	7.65	9.0	11.0	0.798	0.01				
	SW ♀	16	10.0	0.77	0.193	7.70	9.0	12.0	0.754	SIG	1.04	0.919	0.69	0.496
Condyle breadth	SW ♂	11	21.8	1.47	0.444	6.74	19.0	24.0	0.950	0.50				
	SW ♀	16	20.3	1.45	0.364	7.14	17.0	23.0	0.948	0.10	1.02	0.939	2.52	0.018
Dental arch breadth	SW ♂	10	59.6	2.98	0.945	5.00	54.0	64.0	0.966	0.50				
	SW ♀	15	58.0	2.28	0.589	3.93	53.0	63.0	0.953	0.50	1.71	0.353	1.45	0.159

*T calculated using separate variance estimate

Table 12
Descriptive statistics for the Broadbeach male and female mandibles (mm.)

		n	\bar{X}	s	SE	CV	Min.	Max.	W	P	F	P	T	P
Symphseal height	BB ♂	17	33.8	3.12	0.757	9.23	28.0	39.0	0.941	0.10				
	BB ♀	3	31.3	1.52	0.882	4.86	30.0	33.0	0.964	0.50	4.17	0.421	1.36	0.190
Symphseal thickness	BB ♂	24	15.5	1.61	0.330	10.39	12.0	19.0	0.961	0.10				
	BB ♀	4	14.7	0.50	0.250	3.40	14.0	15.0	0.630	SIG	10.43	0.077	0.96	0.346
Corpus height	BB ♂	24	30.0	2.29	0.468	7.63	25.0	35.0	0.974	0.50				
	BB ♀	4	26.7	2.50	1.250	9.36	23.0	28.0	0.630	SIG	1.19	0.672	2.63	0.014
Corpus thickness	BB ♂	24	14.7	1.45	0.296	9.86	12.0	17.0	0.909	0.02				
	BB ♀	4	16.0	0.81	0.408	5.06	15.0	17.0	0.944	0.50	3.16	0.373	1.66	0.109
Bicondylar breadth	BB ♂	19	119.8	5.20	1.194	4.34	109.0	129.0	0.958	0.50				
	BB ♀	1	115.0	-	-	-	-	-	-	-	-	-	-	-
Bigonial breadth	BB ♂	22	101.5	5.38	1.149	5.30	90.0	112.0	0.986	0.95				
	BB ♀	3	94.0	2.64	1.528	2.91	92.0	97.0	0.893	0.10	4.15	0.424	2.35	0.027
Mandibular length	BB ♂	24	116.3	5.08	1.039	4.37	106.0	126.0	0.977	0.50				
	BB ♀	3	114.0	2.00	1.155	1.75	112.0	116.0	1.000	0.98	6.47	0.285	0.78	0.445
Ramus height	BB ♂	24	56.0	4.81	0.983	8.59	48.0	64.0	0.958	0.10				
	BB ♀	3	53.0	1.73	1.000	3.26	51.0	54.0	0.750	SIG	7.72	0.242	1.07	0.295
Max. Ramus breadth	BB ♂	24	46.1	2.92	0.597	6.33	40.0	54.0	0.971	0.50				
	BB ♀	3	44.0	1.73	1.000	3.93	43.0	46.0	0.750	SIG	2.85	0.585	1.22	0.234
Min. Ramus breadth	BB ♂	25	34.1	2.78	0.558	8.15	28.0	40.0	0.977	0.50				
	BB ♀	4	33.5	2.08	1.041	6.21	31.0	36.0	0.998	0.90	1.79	0.703	0.42	0.675
Condyle length	BB ♂	23	9.7	0.61	0.129	6.29	8.0	11.0	0.725	SIG				
	BB ♀	3	10.0	1.00	0.577	10.00	9.0	11.0	1.000	0.98	2.61	0.193	0.64	0.825
Condyle breadth	BB ♂	23	21.1	1.49	0.312	7.06	19.0	26.0	0.835	SIG	-	-	-	-
	BB ♀	2	19.0	-	-	-	19.0	19.0	-	-	-	-	-	-
Dental arch breadth	BB ♂	22	61.4	2.70	0.576	4.40	58.0	67.0	0.917	0.02				
	BB ♀	3	57.3	2.30	1.333	4.01	56.0	60.0	0.750	SIG	1.37	1.00	2.51	0.020

Table 13

Comparative statistics for the Murray Valley (MV) and Coobool Creek (CC) male mandibles (mm.)

		n	\bar{X}	s	CV	F	P	T	P																																																																																																																																																																															
Symphyseal height	MV	43	36.2	2.83	7.82	1.17	0.798	3.36	0.001																																																																																																																																																																															
	CC	14	39.1	2.62	6.70					Symphyseal thickness	MV	44	15.8	1.14	7.22	2.33	0.037	1.47*	0.159	CC	14	16.5	1.74	10.55	Corpus height	MV	42	31.0	2.12	6.84	1.16	0.686	3.89	0.000	CC	13	33.6	2.28	6.79	Corpus thickness	MV	43	14.1	1.60	11.35	1.48	0.468	2.34	0.023	CC	13	15.3	1.31	8.56	Bicondylar breadth	MV	34	120.1	6.12	5.10	1.75	0.558	3.11	0.004	CC	6	128.3	4.63	3.61	Bigonial breadth	MV	38	98.6	7.21	7.31	1.12	0.746	4.39	0.000	CC	9	110.5	7.63	6.90	Mandibular length	MV	43	113.7	5.46	4.80	1.24	0.774	0.96	0.342	CC	10	115.6	4.90	4.24	Ramus height	MV	43	56.4	4.84	8.58	2.20	0.181	3.16	0.003	CC	11	61.3	3.26	5.32	Max. Ramus breadth	MV	42	46.3	2.71	5.85	1.90	0.157	0.92	0.364	CC	10	47.3	3.74	7.91	Min. Ramus breadth	MV	44	34.8	2.47	7.10	1.46	0.334	2.31	0.025	CC	15	36.6	2.99	8.17	Condyle length	MV	38	9.6	0.94	9.79	3.25	0.023	1.67*	0.138	CC	7	10.7	1.70	15.88	Condyle breadth	MV	36	20.8	1.86	8.94	1.23	0.633	3.27	0.002	CC	7	23.4	2.07	8.85	Dental arch breadth	MV	38	61.5	3.14	5.11	1.01	0.895	4.65	0.000
Symphyseal thickness	MV	44	15.8	1.14	7.22	2.33	0.037	1.47*	0.159																																																																																																																																																																															
	CC	14	16.5	1.74	10.55					Corpus height	MV	42	31.0	2.12	6.84	1.16	0.686	3.89	0.000	CC	13	33.6	2.28	6.79	Corpus thickness	MV	43	14.1	1.60	11.35	1.48	0.468	2.34	0.023	CC	13	15.3	1.31	8.56	Bicondylar breadth	MV	34	120.1	6.12	5.10	1.75	0.558	3.11	0.004	CC	6	128.3	4.63	3.61	Bigonial breadth	MV	38	98.6	7.21	7.31	1.12	0.746	4.39	0.000	CC	9	110.5	7.63	6.90	Mandibular length	MV	43	113.7	5.46	4.80	1.24	0.774	0.96	0.342	CC	10	115.6	4.90	4.24	Ramus height	MV	43	56.4	4.84	8.58	2.20	0.181	3.16	0.003	CC	11	61.3	3.26	5.32	Max. Ramus breadth	MV	42	46.3	2.71	5.85	1.90	0.157	0.92	0.364	CC	10	47.3	3.74	7.91	Min. Ramus breadth	MV	44	34.8	2.47	7.10	1.46	0.334	2.31	0.025	CC	15	36.6	2.99	8.17	Condyle length	MV	38	9.6	0.94	9.79	3.25	0.023	1.67*	0.138	CC	7	10.7	1.70	15.88	Condyle breadth	MV	36	20.8	1.86	8.94	1.23	0.633	3.27	0.002	CC	7	23.4	2.07	8.85	Dental arch breadth	MV	38	61.5	3.14	5.11	1.01	0.895	4.65	0.000	CC	10	66.7	3.16	4.74										
Corpus height	MV	42	31.0	2.12	6.84	1.16	0.686	3.89	0.000																																																																																																																																																																															
	CC	13	33.6	2.28	6.79					Corpus thickness	MV	43	14.1	1.60	11.35	1.48	0.468	2.34	0.023	CC	13	15.3	1.31	8.56	Bicondylar breadth	MV	34	120.1	6.12	5.10	1.75	0.558	3.11	0.004	CC	6	128.3	4.63	3.61	Bigonial breadth	MV	38	98.6	7.21	7.31	1.12	0.746	4.39	0.000	CC	9	110.5	7.63	6.90	Mandibular length	MV	43	113.7	5.46	4.80	1.24	0.774	0.96	0.342	CC	10	115.6	4.90	4.24	Ramus height	MV	43	56.4	4.84	8.58	2.20	0.181	3.16	0.003	CC	11	61.3	3.26	5.32	Max. Ramus breadth	MV	42	46.3	2.71	5.85	1.90	0.157	0.92	0.364	CC	10	47.3	3.74	7.91	Min. Ramus breadth	MV	44	34.8	2.47	7.10	1.46	0.334	2.31	0.025	CC	15	36.6	2.99	8.17	Condyle length	MV	38	9.6	0.94	9.79	3.25	0.023	1.67*	0.138	CC	7	10.7	1.70	15.88	Condyle breadth	MV	36	20.8	1.86	8.94	1.23	0.633	3.27	0.002	CC	7	23.4	2.07	8.85	Dental arch breadth	MV	38	61.5	3.14	5.11	1.01	0.895	4.65	0.000	CC	10	66.7	3.16	4.74																									
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Bicondylar breadth	MV	34	120.1	6.12	5.10	1.75	0.558	3.11	0.004																																																																																																																																																																															
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	CC	15	36.6	2.99	8.17					Condyle length	MV	38	9.6	0.94	9.79	3.25	0.023	1.67*	0.138	CC	7	10.7	1.70	15.88	Condyle breadth	MV	36	20.8	1.86	8.94	1.23	0.633	3.27	0.002	CC	7	23.4	2.07	8.85	Dental arch breadth	MV	38	61.5	3.14	5.11	1.01	0.895	4.65	0.000	CC	10	66.7	3.16	4.74																																																																																																																																		
Condyle length	MV	38	9.6	0.94	9.79	3.25	0.023	1.67*	0.138																																																																																																																																																																															
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	CC	7	23.4	2.07	8.85					Dental arch breadth	MV	38	61.5	3.14	5.11	1.01	0.895	4.65	0.000	CC	10	66.7	3.16	4.74																																																																																																																																																																
Dental arch breadth	MV	38	61.5	3.14	5.11	1.01	0.895	4.65	0.000																																																																																																																																																																															
	CC	10	66.7	3.16	4.74																																																																																																																																																																																			

* T calculated using separate variance estimate

Table 14

Comparative statistics for the Murray Valley (MV) and Coobool Creek (CB) female mandibles (mm.)

		n	\bar{X}	s	CV	F	P	T	P																																																																																																																																																																															
Symphyseal height	MV	46	32.5	2.48	7.63	1.61	0.334	4.51	0.000																																																																																																																																																																															
	CC	7	37.2	3.14	8.40					Symphyseal thickness	MV	46	14.8	1.51	10.20	1.46	0.675	0.15	0.882	CC	7	14.7	1.25	8.50	Corpus height	MV	43	27.4	2.20	8.03	1.21	0.639	4.17	0.000	CC	7	31.2	2.43	7.79	Corpus thickness	MV	45	13.6	1.47	10.81	1.35	0.763	1.53	0.132	CC	7	14.5	1.27	8.76	Bicondylar breadth	MV	37	112.8	5.91	5.24	-	-	-	-	CC	0	-	-	-	Bigonial breadth	MV	44	91.9	6.40	6.96	-	-	-	-	CC	1	87.0	-	-	Mandibular length	MV	46	106.3	6.08	5.72	-	-	-	-	CC	2	113.5	-	-	Ramus height	MV	47	50.6	3.63	7.17	3.09	0.072	5.50	0.000	CC	4	61.7	6.39	10.36	Max. Ramus breadth	MV	46	45.5	2.79	5.85	1.80	0.844	0.67	0.507	CC	3	46.6	2.08	4.46	Min. Ramus breadth	MV	47	32.4	2.12	6.56	3.24	0.019	2.10*	0.074	CC	7	35.5	3.82	10.76	Condyle length	MV	40	9.5	1.10	11.67	1.63	0.398	0.84	0.405	CC	4	10.0	1.41	14.10	Condyle breadth	MV	39	19.1	1.79	9.37	1.10	1.000	3.33	0.002	CC	4	22.2	1.70	7.66	Dental arch breadth	MV	40	58.6	2.55	4.35	1.03	1.000	0.65	0.520
Symphyseal thickness	MV	46	14.8	1.51	10.20	1.46	0.675	0.15	0.882																																																																																																																																																																															
	CC	7	14.7	1.25	8.50					Corpus height	MV	43	27.4	2.20	8.03	1.21	0.639	4.17	0.000	CC	7	31.2	2.43	7.79	Corpus thickness	MV	45	13.6	1.47	10.81	1.35	0.763	1.53	0.132	CC	7	14.5	1.27	8.76	Bicondylar breadth	MV	37	112.8	5.91	5.24	-	-	-	-	CC	0	-	-	-	Bigonial breadth	MV	44	91.9	6.40	6.96	-	-	-	-	CC	1	87.0	-	-	Mandibular length	MV	46	106.3	6.08	5.72	-	-	-	-	CC	2	113.5	-	-	Ramus height	MV	47	50.6	3.63	7.17	3.09	0.072	5.50	0.000	CC	4	61.7	6.39	10.36	Max. Ramus breadth	MV	46	45.5	2.79	5.85	1.80	0.844	0.67	0.507	CC	3	46.6	2.08	4.46	Min. Ramus breadth	MV	47	32.4	2.12	6.56	3.24	0.019	2.10*	0.074	CC	7	35.5	3.82	10.76	Condyle length	MV	40	9.5	1.10	11.67	1.63	0.398	0.84	0.405	CC	4	10.0	1.41	14.10	Condyle breadth	MV	39	19.1	1.79	9.37	1.10	1.000	3.33	0.002	CC	4	22.2	1.70	7.66	Dental arch breadth	MV	40	58.6	2.55	4.35	1.03	1.000	0.65	0.520	CC	3	59.6	2.51	4.21										
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Corpus thickness	MV	45	13.6	1.47	10.81	1.35	0.763	1.53	0.132																																																																																																																																																																															
	CC	7	14.5	1.27	8.76					Bicondylar breadth	MV	37	112.8	5.91	5.24	-	-	-	-	CC	0	-	-	-	Bigonial breadth	MV	44	91.9	6.40	6.96	-	-	-	-	CC	1	87.0	-	-	Mandibular length	MV	46	106.3	6.08	5.72	-	-	-	-	CC	2	113.5	-	-	Ramus height	MV	47	50.6	3.63	7.17	3.09	0.072	5.50	0.000	CC	4	61.7	6.39	10.36	Max. Ramus breadth	MV	46	45.5	2.79	5.85	1.80	0.844	0.67	0.507	CC	3	46.6	2.08	4.46	Min. Ramus breadth	MV	47	32.4	2.12	6.56	3.24	0.019	2.10*	0.074	CC	7	35.5	3.82	10.76	Condyle length	MV	40	9.5	1.10	11.67	1.63	0.398	0.84	0.405	CC	4	10.0	1.41	14.10	Condyle breadth	MV	39	19.1	1.79	9.37	1.10	1.000	3.33	0.002	CC	4	22.2	1.70	7.66	Dental arch breadth	MV	40	58.6	2.55	4.35	1.03	1.000	0.65	0.520	CC	3	59.6	2.51	4.21																																								
Bicondylar breadth	MV	37	112.8	5.91	5.24	-	-	-	-																																																																																																																																																																															
	CC	0	-	-	-					Bigonial breadth	MV	44	91.9	6.40	6.96	-	-	-	-	CC	1	87.0	-	-	Mandibular length	MV	46	106.3	6.08	5.72	-	-	-	-	CC	2	113.5	-	-	Ramus height	MV	47	50.6	3.63	7.17	3.09	0.072	5.50	0.000	CC	4	61.7	6.39	10.36	Max. Ramus breadth	MV	46	45.5	2.79	5.85	1.80	0.844	0.67	0.507	CC	3	46.6	2.08	4.46	Min. Ramus breadth	MV	47	32.4	2.12	6.56	3.24	0.019	2.10*	0.074	CC	7	35.5	3.82	10.76	Condyle length	MV	40	9.5	1.10	11.67	1.63	0.398	0.84	0.405	CC	4	10.0	1.41	14.10	Condyle breadth	MV	39	19.1	1.79	9.37	1.10	1.000	3.33	0.002	CC	4	22.2	1.70	7.66	Dental arch breadth	MV	40	58.6	2.55	4.35	1.03	1.000	0.65	0.520	CC	3	59.6	2.51	4.21																																																							
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	CC	1	87.0	-	-					Mandibular length	MV	46	106.3	6.08	5.72	-	-	-	-	CC	2	113.5	-	-	Ramus height	MV	47	50.6	3.63	7.17	3.09	0.072	5.50	0.000	CC	4	61.7	6.39	10.36	Max. Ramus breadth	MV	46	45.5	2.79	5.85	1.80	0.844	0.67	0.507	CC	3	46.6	2.08	4.46	Min. Ramus breadth	MV	47	32.4	2.12	6.56	3.24	0.019	2.10*	0.074	CC	7	35.5	3.82	10.76	Condyle length	MV	40	9.5	1.10	11.67	1.63	0.398	0.84	0.405	CC	4	10.0	1.41	14.10	Condyle breadth	MV	39	19.1	1.79	9.37	1.10	1.000	3.33	0.002	CC	4	22.2	1.70	7.66	Dental arch breadth	MV	40	58.6	2.55	4.35	1.03	1.000	0.65	0.520	CC	3	59.6	2.51	4.21																																																																						
Mandibular length	MV	46	106.3	6.08	5.72	-	-	-	-																																																																																																																																																																															
	CC	2	113.5	-	-					Ramus height	MV	47	50.6	3.63	7.17	3.09	0.072	5.50	0.000	CC	4	61.7	6.39	10.36	Max. Ramus breadth	MV	46	45.5	2.79	5.85	1.80	0.844	0.67	0.507	CC	3	46.6	2.08	4.46	Min. Ramus breadth	MV	47	32.4	2.12	6.56	3.24	0.019	2.10*	0.074	CC	7	35.5	3.82	10.76	Condyle length	MV	40	9.5	1.10	11.67	1.63	0.398	0.84	0.405	CC	4	10.0	1.41	14.10	Condyle breadth	MV	39	19.1	1.79	9.37	1.10	1.000	3.33	0.002	CC	4	22.2	1.70	7.66	Dental arch breadth	MV	40	58.6	2.55	4.35	1.03	1.000	0.65	0.520	CC	3	59.6	2.51	4.21																																																																																					
Ramus height	MV	47	50.6	3.63	7.17	3.09	0.072	5.50	0.000																																																																																																																																																																															
	CC	4	61.7	6.39	10.36					Max. Ramus breadth	MV	46	45.5	2.79	5.85	1.80	0.844	0.67	0.507	CC	3	46.6	2.08	4.46	Min. Ramus breadth	MV	47	32.4	2.12	6.56	3.24	0.019	2.10*	0.074	CC	7	35.5	3.82	10.76	Condyle length	MV	40	9.5	1.10	11.67	1.63	0.398	0.84	0.405	CC	4	10.0	1.41	14.10	Condyle breadth	MV	39	19.1	1.79	9.37	1.10	1.000	3.33	0.002	CC	4	22.2	1.70	7.66	Dental arch breadth	MV	40	58.6	2.55	4.35	1.03	1.000	0.65	0.520	CC	3	59.6	2.51	4.21																																																																																																				
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	CC	3	46.6	2.08	4.46					Min. Ramus breadth	MV	47	32.4	2.12	6.56	3.24	0.019	2.10*	0.074	CC	7	35.5	3.82	10.76	Condyle length	MV	40	9.5	1.10	11.67	1.63	0.398	0.84	0.405	CC	4	10.0	1.41	14.10	Condyle breadth	MV	39	19.1	1.79	9.37	1.10	1.000	3.33	0.002	CC	4	22.2	1.70	7.66	Dental arch breadth	MV	40	58.6	2.55	4.35	1.03	1.000	0.65	0.520	CC	3	59.6	2.51	4.21																																																																																																																			
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	CC	7	35.5	3.82	10.76					Condyle length	MV	40	9.5	1.10	11.67	1.63	0.398	0.84	0.405	CC	4	10.0	1.41	14.10	Condyle breadth	MV	39	19.1	1.79	9.37	1.10	1.000	3.33	0.002	CC	4	22.2	1.70	7.66	Dental arch breadth	MV	40	58.6	2.55	4.35	1.03	1.000	0.65	0.520	CC	3	59.6	2.51	4.21																																																																																																																																		
Condyle length	MV	40	9.5	1.10	11.67	1.63	0.398	0.84	0.405																																																																																																																																																																															
	CC	4	10.0	1.41	14.10					Condyle breadth	MV	39	19.1	1.79	9.37	1.10	1.000	3.33	0.002	CC	4	22.2	1.70	7.66	Dental arch breadth	MV	40	58.6	2.55	4.35	1.03	1.000	0.65	0.520	CC	3	59.6	2.51	4.21																																																																																																																																																	
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Dental arch breadth	MV	40	58.6	2.55	4.35	1.03	1.000	0.65	0.520																																																																																																																																																																															
	CC	3	59.6	2.51	4.21																																																																																																																																																																																			

* T calculated using separate variance estimate

Table 15

Comparative statistics for the Coobool Creek (CC) and Swanport (SW) male mandibles (mm.)

		n	\bar{X}	s	CV	F	P	T	P
Symphyseal height	CC	14	39.1	2.62	6.70				
	SW	16	32.6	3.00	9.20	1.31	0.630	6.28	0.000
Symphyseal thickness	CC	14	16.5	1.74	10.55				
	SW	16	14.3	1.08	7.55	2.56	0.084	4.20	0.000
Corpus height	CC	13	33.6	2.28	6.79				
	SW	16	27.6	2.65	9.60	1.34	0.613	6.44	0.000
Corpus thickness	CC	13	15.3	1.31	8.56				
	SW	16	14.3	1.58	11.05	1.44	0.529	1.82	0.081
Bicondylar breadth	CC	6	128.3	4.63	3.61				
	SW	14	121.2	4.15	3.83	1.24	0.689	3.40	0.003
Bigonial breadth	CC	9	110.5	7.63	6.90				
	SW	14	101.6	4.21	6.87	3.28	0.056	3.20*	0.008
Mandibular length	CC	9	114.6	6.44	4.24				
	SW	15	108.5	4.38	4.04	2.15	0.200	2.78	0.011
Ramus height	CC	11	61.3	2.53	5.32				
	SW	15	62.1	3.42	9.12	1.83	0.341	0.93	0.363
Max. Ramus breadth	CC	10	48.5	3.59	7.91				
	SW	15	51.7	4.36	4.36	1.47	0.567	1.94	0.065
Min. Ramus breadth	CC	15	36.6	2.99	8.17				
	SW	15	36.6	3.17	10.70	1.13	0.825	0.00	1.000
Condyle length	CC	7	10.7	1.70	15.88				
	SW	11	10.2	0.78	7.70	4.70	0.032	0.64*	0.538
Condyle breadth	CC	7	23.4	2.07	8.85				
	SW	11	21.8	1.47	7.14	1.98	0.324	1.94	0.071
Dental arch breadth	CC	10	66.7	3.16	4.74				
	SW	10	59.6	2.98	3.93	1.12	0.868	5.16	0.000

* T calculated using separate variance estimate

Table 16

Comparative statistics for the Coobool Creek (CC) and Swanport (SW) female mandibles (mm.)

		n	\bar{X}	s	CV	F	P	T	P																																																																																																																																																																															
Symphyseal height	CC	7	37.2	3.14	8.44	1.47	0.491	6.45	0.000																																																																																																																																																																															
	SW	18	29.3	2.59	8.84					Symphyseal thickness	CC	7	14.7	1.25	8.50	1.07	1.000	0.96	0.348	SW	18	14.1	1.29	9.15	Corpus height	CC	7	31.2	2.43	7.79	2.70	0.105	7.75	0.000	SW	17	25.0	1.47	5.88	Corpus thickness	CC	7	14.5	1.27	8.76	1.35	0.748	0.30	0.766	SW	17	14.7	1.48	3.06	Bicondylar breadth	CC	0	-	-	-	-	-	-	-	SW	17	111.7	4.28	3.83	Bigonial breadth	CC	1	87.0	-	-	-	-	-	-	SW	17	93.8	6.44	6.87	Mandibular length	CC	2	113.5	-	-	-	-	-	-	SW	18	104.3	4.21	4.04	Ramus height	CC	4	61.7	6.39	10.36	1.70	0.410	2.80	0.011	SW	18	53.7	4.90	9.12	Max. Ramus breadth	CC	3	46.6	2.08	4.46	2.57	0.633	1.27	0.219	SW	18	49.2	3.33	6.77	Min. Ramus breadth	CC	7	35.5	3.82	10.76	1.01	0.904	0.04	0.967	SW	18	35.5	3.80	10.70	Condyle length	CC	4	10.0	1.41	14.10	3.36	0.094	0.12	0.904	SW	16	10.0	0.77	7.70	Condyle breadth	CC	4	22.2	1.70	7.66	1.38	0.575	2.24	0.038	SW	16	20.3	1.45	7.14	Dental arch breadth	CC	3	59.6	2.51	4.21	1.22	0.652	1.09	0.290
Symphyseal thickness	CC	7	14.7	1.25	8.50	1.07	1.000	0.96	0.348																																																																																																																																																																															
	SW	18	14.1	1.29	9.15					Corpus height	CC	7	31.2	2.43	7.79	2.70	0.105	7.75	0.000	SW	17	25.0	1.47	5.88	Corpus thickness	CC	7	14.5	1.27	8.76	1.35	0.748	0.30	0.766	SW	17	14.7	1.48	3.06	Bicondylar breadth	CC	0	-	-	-	-	-	-	-	SW	17	111.7	4.28	3.83	Bigonial breadth	CC	1	87.0	-	-	-	-	-	-	SW	17	93.8	6.44	6.87	Mandibular length	CC	2	113.5	-	-	-	-	-	-	SW	18	104.3	4.21	4.04	Ramus height	CC	4	61.7	6.39	10.36	1.70	0.410	2.80	0.011	SW	18	53.7	4.90	9.12	Max. Ramus breadth	CC	3	46.6	2.08	4.46	2.57	0.633	1.27	0.219	SW	18	49.2	3.33	6.77	Min. Ramus breadth	CC	7	35.5	3.82	10.76	1.01	0.904	0.04	0.967	SW	18	35.5	3.80	10.70	Condyle length	CC	4	10.0	1.41	14.10	3.36	0.094	0.12	0.904	SW	16	10.0	0.77	7.70	Condyle breadth	CC	4	22.2	1.70	7.66	1.38	0.575	2.24	0.038	SW	16	20.3	1.45	7.14	Dental arch breadth	CC	3	59.6	2.51	4.21	1.22	0.652	1.09	0.290	SW	15	58.0	2.28	3.93										
Corpus height	CC	7	31.2	2.43	7.79	2.70	0.105	7.75	0.000																																																																																																																																																																															
	SW	17	25.0	1.47	5.88					Corpus thickness	CC	7	14.5	1.27	8.76	1.35	0.748	0.30	0.766	SW	17	14.7	1.48	3.06	Bicondylar breadth	CC	0	-	-	-	-	-	-	-	SW	17	111.7	4.28	3.83	Bigonial breadth	CC	1	87.0	-	-	-	-	-	-	SW	17	93.8	6.44	6.87	Mandibular length	CC	2	113.5	-	-	-	-	-	-	SW	18	104.3	4.21	4.04	Ramus height	CC	4	61.7	6.39	10.36	1.70	0.410	2.80	0.011	SW	18	53.7	4.90	9.12	Max. Ramus breadth	CC	3	46.6	2.08	4.46	2.57	0.633	1.27	0.219	SW	18	49.2	3.33	6.77	Min. Ramus breadth	CC	7	35.5	3.82	10.76	1.01	0.904	0.04	0.967	SW	18	35.5	3.80	10.70	Condyle length	CC	4	10.0	1.41	14.10	3.36	0.094	0.12	0.904	SW	16	10.0	0.77	7.70	Condyle breadth	CC	4	22.2	1.70	7.66	1.38	0.575	2.24	0.038	SW	16	20.3	1.45	7.14	Dental arch breadth	CC	3	59.6	2.51	4.21	1.22	0.652	1.09	0.290	SW	15	58.0	2.28	3.93																									
Corpus thickness	CC	7	14.5	1.27	8.76	1.35	0.748	0.30	0.766																																																																																																																																																																															
	SW	17	14.7	1.48	3.06					Bicondylar breadth	CC	0	-	-	-	-	-	-	-	SW	17	111.7	4.28	3.83	Bigonial breadth	CC	1	87.0	-	-	-	-	-	-	SW	17	93.8	6.44	6.87	Mandibular length	CC	2	113.5	-	-	-	-	-	-	SW	18	104.3	4.21	4.04	Ramus height	CC	4	61.7	6.39	10.36	1.70	0.410	2.80	0.011	SW	18	53.7	4.90	9.12	Max. Ramus breadth	CC	3	46.6	2.08	4.46	2.57	0.633	1.27	0.219	SW	18	49.2	3.33	6.77	Min. Ramus breadth	CC	7	35.5	3.82	10.76	1.01	0.904	0.04	0.967	SW	18	35.5	3.80	10.70	Condyle length	CC	4	10.0	1.41	14.10	3.36	0.094	0.12	0.904	SW	16	10.0	0.77	7.70	Condyle breadth	CC	4	22.2	1.70	7.66	1.38	0.575	2.24	0.038	SW	16	20.3	1.45	7.14	Dental arch breadth	CC	3	59.6	2.51	4.21	1.22	0.652	1.09	0.290	SW	15	58.0	2.28	3.93																																								
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	SW	17	111.7	4.28	3.83					Bigonial breadth	CC	1	87.0	-	-	-	-	-	-	SW	17	93.8	6.44	6.87	Mandibular length	CC	2	113.5	-	-	-	-	-	-	SW	18	104.3	4.21	4.04	Ramus height	CC	4	61.7	6.39	10.36	1.70	0.410	2.80	0.011	SW	18	53.7	4.90	9.12	Max. Ramus breadth	CC	3	46.6	2.08	4.46	2.57	0.633	1.27	0.219	SW	18	49.2	3.33	6.77	Min. Ramus breadth	CC	7	35.5	3.82	10.76	1.01	0.904	0.04	0.967	SW	18	35.5	3.80	10.70	Condyle length	CC	4	10.0	1.41	14.10	3.36	0.094	0.12	0.904	SW	16	10.0	0.77	7.70	Condyle breadth	CC	4	22.2	1.70	7.66	1.38	0.575	2.24	0.038	SW	16	20.3	1.45	7.14	Dental arch breadth	CC	3	59.6	2.51	4.21	1.22	0.652	1.09	0.290	SW	15	58.0	2.28	3.93																																																							
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	SW	18	35.5	3.80	10.70					Condyle length	CC	4	10.0	1.41	14.10	3.36	0.094	0.12	0.904	SW	16	10.0	0.77	7.70	Condyle breadth	CC	4	22.2	1.70	7.66	1.38	0.575	2.24	0.038	SW	16	20.3	1.45	7.14	Dental arch breadth	CC	3	59.6	2.51	4.21	1.22	0.652	1.09	0.290	SW	15	58.0	2.28	3.93																																																																																																																																		
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	SW	15	58.0	2.28	3.93																																																																																																																																																																																			

Table 17

Comparative statistics for the Coobool Creek (CC) and Broadbeach (BB) male mandibles (mm.)

		n	\bar{X}	s	CV	F	P	T	P
Symphyseal height	CC	14	39.1	2.62	6.70				
	BB	17	33.8	3.12	9.23	1.41	0.537	5.01	0.000
Symphyseal height	CC	14	16.5	1.74	10.55				
	BB	24	15.5	1.61	10.39	1.16	0.725	1.84	0.074
Corpus height	CC	13	33.6	2.28	6.79				
	BB	24	30.0	2.29	7.63	1.01	1.000	4.63	0.000
Corpus thickness	CC	13	15.3	1.31	8.56				
	BB	24	14.7	1.45	9.86	1.22	0.742	1.15	0.257
Bicondylar breadth	CC	6	128.3	4.63	3.61				
	BB	19	119.8	5.20	4.34	1.26	0.862	3.54	0.002
Bigonial breadth	CC	9	110.5	7.63	6.90				
	BB	22	101.5	5.38	5.30	2.01	0.192	3.74	0.001
Mandibular length	CC	10	115.6	4.90	4.24				
	BB	24	116.3	5.08	4.37	1.08	0.962	0.39	0.701
Ramus height	CC	11	61.3	3.26	5.32				
	BB	24	56.0	4.81	8.29	2.17	0.202	3.32	0.002
Max. Ramus breadth	CC	10	47.3	3.74	7.91				
	BB	24	46.1	2.92	6.33	1.64	0.325	0.98	0.333
Min. Ramus breadth	CC	10	36.6	2.99	8.17				
	BB	25	34.1	2.78	8.15	1.15	0.737	2.72	0.010
Condyle length	CC	7	10.7	1.70	15.88				
	BB	23	9.7	0.61	6.29	7.58	0.000	2.35*	0.026
Condyle breadth	CC	7	23.4	2.07	8.85				
	BB	23	21.1	1.49	7.06	1.91	0.248	3.19	0.003
Dental arch breadth	CC	10	66.7	3.16	4.74				
	BB	22	61.4	2.70	4.40	1.37	0.525	4.83	0.000

*T calculated using separate variance estimate

Table 18

Comparative statistics for the Murray Valley (MV) and Swanport (SW) male mandibles (mm.)

		n	\bar{X}	s	CV	F	P	T	P																																																																																																																																																																															
Symphyseal height	MV	43	36.2	2.83	7.82	1.12	0.732	4.30	0.000																																																																																																																																																																															
	SW	16	32.6	3.00	9.20					Symphyseal thickness	MV	44	15.8	1.14	7.22	1.10	0.882	4.46	0.000	SW	16	14.3	1.08	7.55	Corpus height	MV	42	31.0	2.12	6.84	1.56	0.259	4.99	0.000	SW	16	27.6	2.65	9.60	Corpus thickness	MV	43	14.1	1.60	11.35	1.03	1.000	0.32	0.750	SW	16	14.3	1.58	11.05	Bicondylar breadth	MV	34	120.1	6.12	5.10	2.17	0.137	0.60	0.554	SW	14	121.2	4.15	3.42	Bigonial breadth	MV	38	98.6	7.21	7.31	2.93	0.041	1.82*	0.076	SW	14	101.6	4.21	4.14	Mandibular length	MV	43	113.7	5.46	4.80	1.55	0.378	3.36	0.001	SW	15	108.5	4.38	4.04	Ramus height	MV	43	56.4	4.84	8.58	2.00	0.159	4.17	0.000	SW	15	62.1	3.42	5.51	Max. Ramus breadth	MV	42	46.3	2.71	5.85	2.59	0.018	5.56*	0.000	SW	15	36.6	3.17	8.66	Min. Ramus breadth	MV	44	34.8	2.47	7.10	1.65	0.208	2.26	0.027	SW	15	36.6	3.17	8.66	Condyle length	MV	38	9.6	0.94	9.79	1.45	0.549	2.13	0.038	SW	11	10.2	0.78	7.65	Condyle breadth	MV	36	20.8	1.86	8.94	1.62	0.426	1.55	0.127	SW	11	21.8	1.47	6.74	Dental arch breadth	MV	38	61.5	3.14	5.11	1.11	0.937	1.72	0.093
Symphyseal thickness	MV	44	15.8	1.14	7.22	1.10	0.882	4.46	0.000																																																																																																																																																																															
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	SW	15	36.6	3.17	8.66					Condyle length	MV	38	9.6	0.94	9.79	1.45	0.549	2.13	0.038	SW	11	10.2	0.78	7.65	Condyle breadth	MV	36	20.8	1.86	8.94	1.62	0.426	1.55	0.127	SW	11	21.8	1.47	6.74	Dental arch breadth	MV	38	61.5	3.14	5.11	1.11	0.937	1.72	0.093	SW	10	59.6	2.98	5.00																																																																																																																																		
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	SW	11	10.2	0.78	7.65					Condyle breadth	MV	36	20.8	1.86	8.94	1.62	0.426	1.55	0.127	SW	11	21.8	1.47	6.74	Dental arch breadth	MV	38	61.5	3.14	5.11	1.11	0.937	1.72	0.093	SW	10	59.6	2.98	5.00																																																																																																																																																	
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	SW	11	21.8	1.47	6.74					Dental arch breadth	MV	38	61.5	3.14	5.11	1.11	0.937	1.72	0.093	SW	10	59.6	2.98	5.00																																																																																																																																																																
Dental arch breadth	MV	38	61.5	3.14	5.11	1.11	0.937	1.72	0.093																																																																																																																																																																															
	SW	10	59.6	2.98	5.00																																																																																																																																																																																			

*T calculated using separate variance estimate

Table 19

Comparative statistics for the Murray Valley (MV) and Swanport (SW) female mandibles (mm.)

		n	\bar{X}	s	CV	F	P	T	P
Symphyseal height	MV	46	32.5	2.48	7.63				
	SW	18	29.3	2.59	8.84	1.09	0.781	4.58	0.000
Symphyseal thickness	MV	46	14.8	1.51	10.20				
	SW	18	14.1	1.29	9.15	1.37	0.489	1.57	0.121
Corpus height	MV	43	27.4	2.20	8.03				
	SW	17	25.0	1.47	5.88	2.23	0.084	4.17	0.000
Corpus thickness	MV	45	13.6	1.47	10.81				
	SW	17	14.7	1.48	3.06	1.00	0.940	2.61	0.011
Bicondylar breadth	MV	37	112.8	5.91	5.24				
	SW	17	111.7	4.28	3.83	1.91	0.168	0.74	0.462
Bigonial breadth	MV	44	91.9	6.40	6.96				
	SW	17	93.8	6.44	6.87	1.01	0.924	1.02	0.312
Mandibular length	MV	46	106.3	6.08	5.72				
	SW	18	104.3	4.21	4.04	2.08	0.101	1.31	0.194
Ramus height	MV	47	50.6	3.60	7.11				
	SW	18	53.7	4.90	9.12	1.85	0.100	2.81	0.007
Max. Ramus breadth	MV	46	45.5	2.79	6.13				
	SW	18	49.2	3.33	6.77	1.42	0.340	4.46	0.000
Min. Ramus breadth	MV	47	32.4	2.12	6.56				
	SW	18	35.5	3.80	10.70	3.21	0.002	3.19*	0.004
Condyle length	MV	40	9.5	1.10	11.67				
	SW	16	10.0	0.77	7.70	2.07	0.131	1.85	0.070
Condyle breadth	MV	39	19.1	1.79	9.37				
	SW	16	20.3	1.45	7.14	1.52	0.385	2.46	0.017
Dental arch breadth	MV	40	58.6	2.55	4.35				
	SW	15	58.0	2.28	3.93	1.25	0.668	0.81	0.423

* T calculated using separate variance estimate

Table 20

Comparative statistics for the Murray Valley (MV) and Broadbeach (BB) male mandibles (mm.)

		n	\bar{X}	s	CV	F	P	T	P																																																																																																																																																																															
Symphyseal height	MV	43	36.2	2.83	7.82	1.21	0.602	2.84	0.006																																																																																																																																																																															
	BB	17	33.8	3.12	9.23					Symphyseal thickness	MV	44	15.8	1.14	7.22	2.01	0.048	0.81*	0.426	BB	24	15.5	1.61	10.39	Corpus height	MV	42	31.0	2.12	6.84	1.17	0.653	1.76	0.084	BB	24	30.0	2.29	7.63	Corpus thickness	MV	43	14.1	1.60	11.35	1.22	0.623	1.49	0.142	BB	24	14.7	1.45	9.86	Bicondylar breadth	MV	34	120.1	6.12	5.10	1.38	0.470	0.15	0.880	BB	19	119.8	5.20	4.34	Bigonial breadth	MV	38	98.6	7.21	7.31	1.79	0.157	1.62	0.112	BB	22	101.5	5.38	5.30	Mandibular length	MV	43	113.7	5.46	4.80	1.15	0.730	1.87	0.066	BB	24	116.3	5.08	4.37	Ramus height	MV	43	56.4	4.84	8.58	1.01	1.000	0.34	0.732	BB	24	56.0	4.81	8.29	Max. Ramus breadth	MV	42	46.3	2.71	5.85	1.16	0.659	0.33	0.746	BB	24	46.1	2.92	6.33	Min. Ramus breadth	MV	44	34.8	2.47	7.10	1.27	0.484	1.15	0.256	BB	25	34.1	2.78	8.15	Condyle length	MV	38	9.6	0.94	9.79	2.33	0.038	0.67*	0.507	BB	23	9.7	0.61	6.29	Condyle breadth	MV	36	20.8	1.86	8.94	1.56	0.275	0.68	0.502	BB	23	21.1	1.49	7.06	Dental arch breadth	MV	38	61.5	3.14	5.11	1.35	0.468	0.06	0.955
Symphyseal thickness	MV	44	15.8	1.14	7.22	2.01	0.048	0.81*	0.426																																																																																																																																																																															
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	BB	22	61.4	2.70	4.40																																																																																																																																																																																			

* T calculated using separate variance estimate

Table 21

Comparative statistics for the Swanport (SW) and Broadbeach (BB) male mandibles (mm.)

		n	\bar{x}	s	CV	F	P	T	P																																																																																																																																																																															
Symphyseal height	SW	16	32.6	3.00	9.20	1.08	0.892	1.18	0.248																																																																																																																																																																															
	BB	24	33.8	3.12	9.23					Symphyseal thickness	SW	16	14.3	1.08	7.55	2.20	0.118	2.53	0.016	BB	24	15.5	1.61	10.39	Corpus height	SW	16	27.6	2.65	9.60	1.34	0.517	2.99	0.005	BB	24	30.0	2.29	7.63	Corpus thickness	SW	16	14.3	1.58	11.05	1.18	0.697	0.90	0.373	BB	24	14.7	1.45	9.86	Bicondylar breadth	SW	14	121.2	4.15	3.42	1.57	0.412	0.78	0.440	BB	19	119.8	5.20	4.34	Bigonial breadth	SW	14	101.6	4.21	4.14	1.63	0.366	0.06	0.955	BB	22	101.5	5.38	5.30	Mandibular length	SW	15	108.5	4.38	4.04	1.34	0.575	4.90	0.000	BB	24	116.3	5.08	4.37	Ramus height	SW	15	62.1	3.42	5.51	1.94	0.187	4.27	0.000	BB	24	56.0	4.81	8.29	Max. Ramus breadth	SW	15	51.7	4.36	8.43	2.23	0.085	4.81	0.000	BB	24	46.1	2.92	6.33	Min. Ramus breadth	SW	15	36.6	3.17	8.66	1.30	0.556	2.65	0.012	BB	25	34.1	2.78	8.15	Condyle length	SW	11	10.2	0.78	7.65	1.61	0.336	2.15	0.039	BB	23	9.7	0.61	6.29	Condyle breadth	SW	11	21.8	1.47	6.74	1.04	1.000	1.18	0.247	BB	23	21.1	1.49	7.06	Dental arch breadth	SW	10	59.6	2.98	5.00	1.22	0.667	1.74	0.092
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	BB	24	14.7	1.45	9.86					Bicondylar breadth	SW	14	121.2	4.15	3.42	1.57	0.412	0.78	0.440	BB	19	119.8	5.20	4.34	Bigonial breadth	SW	14	101.6	4.21	4.14	1.63	0.366	0.06	0.955	BB	22	101.5	5.38	5.30	Mandibular length	SW	15	108.5	4.38	4.04	1.34	0.575	4.90	0.000	BB	24	116.3	5.08	4.37	Ramus height	SW	15	62.1	3.42	5.51	1.94	0.187	4.27	0.000	BB	24	56.0	4.81	8.29	Max. Ramus breadth	SW	15	51.7	4.36	8.43	2.23	0.085	4.81	0.000	BB	24	46.1	2.92	6.33	Min. Ramus breadth	SW	15	36.6	3.17	8.66	1.30	0.556	2.65	0.012	BB	25	34.1	2.78	8.15	Condyle length	SW	11	10.2	0.78	7.65	1.61	0.336	2.15	0.039	BB	23	9.7	0.61	6.29	Condyle breadth	SW	11	21.8	1.47	6.74	1.04	1.000	1.18	0.247	BB	23	21.1	1.49	7.06	Dental arch breadth	SW	10	59.6	2.98	5.00	1.22	0.667	1.74	0.092	BB	22	61.4	2.70	4.40																																								
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3.2 Variance

Variation in the mandibular dimensions for each of the samples was compared using the F ratio developed by Snedecor (1946). Very few F values were found to be significant at the .05 level, with the general pattern indicating homogeneity of variance between samples. Two variables (symphyseal thickness and condyle length) displayed high levels of variance in the Murray Valley, Coobool Creek and Swanport male samples. An examination of the distribution of these two variables using the Shapiro-Wilk statistic (W) indicated marked distributional abnormalities for each of these variables resulting from inadequate measurement scale. As the scale was too large there was a tendency for the measurements to cluster around too few points.

Seven other significant values of F, covering five different variables, were obtained in the analysis. One variable (minimum ramus breadth) gained the only two significant F values in the female comparisons. The lower variance for this dimension in the Murray Valley sample resulted in significant F values when this sample was compared with the Coobool Creek ($P = .000$) and Swanport ($P = .000$) samples.

Apart from symphyseal thickness and condyle length, two variables (bigonial breadth and maximum ramus breadth) obtained significant values for F in the male comparisons. There is significantly greater variance in

bigonial breadth in the Murray Valley ($P = .000$) and Coobool Creek ($P = .000$) mandibles when compared with the Swanport series, and in the maximum breadth of the ramus in the Swanport mandibles when compared with the Murray Valley series ($P = .000$).

In comparisons of the male and female data significant F values were obtained for two variables, corpus height (Swanport males and females) and ramus height (Murray Valley males and females). Both of these variables display greater variance in the male mandibles.

The levels of variation for each of the variables can be directly compared using the coefficients of variation (CV). A similar pattern of variation is found in each of the samples with the greatest variance (CV = 9.1mm - 15.8mm) associated with dimensions of the mandibular corpus and condyle. Undoubtedly the major factor contributing to the relatively high variance in these dimensions (Symphyseal height, symphyseal thickness, corpus height, corpus thickness, condyle length and condyle breadth) is measurement scale.

The two largest coefficients of variation are for condyle length in the Coobool Creek male (CV = 15.8mm) and female (CV = 14.1mm) mandibles. Overall variance for the four male samples is remarkably similar with little difference between the mean coefficients of variation (Murray Valley \bar{X} 7.37mm, Coobool Creek \bar{X} 7.55mm, Swanport \bar{X} 6.99mm and Broadbeach \bar{X} 7.07mm).

3.3 Correlation

The association of the measurements used in the multivariate analysis was tested using Pearson's linear correlation coefficient (r). Correlation matrices were developed from the Murray Valley sample to examine possible sex-based variation in correlation, the effect of the distance between the male and female means on the size of the correlation coefficient and the topographical and biological correlations between the variables.

The Murray Valley sample was chosen for the initial analysis due to the relatively large size of both the male and female sample. Matrices were formed using the convention of listwise deletion of missing data. With this method mandibles with one or more missing variables are excluded from the analysis. Missing data reduced the size of the Murray Valley mandible sample to 23 males and 22 females. Correlation matrices were developed for the male, female and pooled samples (Tables 22-24). For samples of 22-23 a correlation coefficient of .34 - .35 is significant at the .05 level, while for the pooled sample (n=45) a correlation coefficient of .24 is significant at the .05 level. Bivariate plots were produced for each pair of variables and examined for distributional linearity and, in the pooled sample, the distance between the male and female clusters.

Correlation matrices were then developed for the Coobool Creek data using the convention of pairwise deletion of missing data (Table 25). The incomplete condition of the Coobool Creek mandibles made pairwise deletion the only practical choice, as listwise deletion would have reduced the size of the sample to four. Pairwise deletion has the advantage of maximising the use of the available data but the disadvantage (where data sets are incomplete) of using a potentially different subset for the calculation of each correlation coefficient. The Coobool Creek matrices were then compared with the Murray Valley data. For purposes of this analysis only correlation coefficients greater than .399, which have a reasonably linear distribution, are considered significant.

Murray Valley males

Of 169 correlations in the Murray Valley male matrix only 25 were greater than $r = .39$. The highest positive correlation ($r = .71$) was between symphyseal height and corpus height, followed by the correlation

between corpus height and the length of the mandible ($r = .66$). Five correlations were negative, the highest ($r = -.162$) being that between minimum ramus breadth and condyle breadth (Table 22).

Summary (positive correlations greater than .39)

(I90) Symphyseal height: correlated with symphyseal thickness, corpus height, corpus thickness, mandibular length, bicondylar and bigonial breadth and the maximum breadth of the ramus.

(I91) Symphyseal thickness: correlated with symphyseal height, corpus thickness, ramus height and the length of the condyle.

(I92) Corpus height: correlated with symphyseal height, the length of the mandible and the maximum breadth of the ramus.

(I93) Corpus thickness: correlated with symphyseal height, symphyseal thickness, bicondylar breadth and the breadth of the dental arch.

(I94) Bicondylar breadth: correlated with symphyseal height, corpus thickness, bigonial breadth, length of the mandible and the maximum breadth of the ramus.

(I95) Bigonial breadth: correlated with bicondylar breadth, the length of the mandible and the maximum breadth of the ramus.

(I96) Mandibular length: correlated with corpus height, bicondylar breadth and bigonial breadth.

(I97) Ramus height: correlated with symphyseal thickness and condyle length.

(I98) Maximum ramus breadth: correlated with symphyseal height, corpus thickness, corpus height, bicondylar and bigonial breadth.

(I99) Minimum ramus breadth: no correlation greater than $r = .39$.

(I100) Condyle length: correlated with symphyseal thickness, ramus height, condyle breadth and the width of the mandibular arch.

(I101) Condyle breadth: correlated with condyle length.

(I102) Dental arch breadth: correlated with corpus thickness.

Murray Valley females

There is a lower overall level of correlation in the Murray Valley female matrix than that for the Murray Valley males. Only nine of the 169 correlations were greater than $r = .39$. The highest correlation ($r = .66$) is between symphyseal height and the length of the mandible, followed by the correlation between maximum and minimum ramus breadth ($r = .62$). There are no negative correlations in the female matrix (Table 23).

Summary (positive correlations greater than .39)

(I90) Symphyseal height: correlated with corpus height and the length of the mandible.

(I91) Symphyseal thickness: correlated with the breadth of the dental arch.

(I92) Corpus height: correlated with symphyseal height and the length of the mandible.

(I93) Corpus thickness: correlated with bigonial breadth.

(I94) Bicondylar breadth: no correlations greater than .39.

(I95) Bignonial breadth: correlated with corpus thickness.

(I96) Mandibular length: correlated with corpus height and maximum and minimum ramus breadths.

(I97) Ramus height: no correlations greater than .39.

(I98) Maximum ramus breadth: correlated with minimum ramus breadth, the length of the mandible and condyle breadth.

(I99) Minimum ramus breadth: correlated with maximum ramus breadth and the length of the mandible.

(I100) Condyle length: correlated with maximum ramus breadth.

(I101) Condyle breadth: no correlations greater than .39.

(I102) Dental arch breadth: correlated with symphyseal thickness.

Pooled male-female sample

The level of correlation in the pooled sample increased substantially with 32 of the 169 correlations greater than .39. The highest correlation ($r = .755$) is that for symphyseal height and corpus height, followed by ($r = .750$) that for symphyseal height and mandibular length and $r = .718$ for corpus height and the length of the mandible. All the remaining correlations are less than $r = .60$. There are no negative correlations (Table 24).

An examination of bivariate plots for these data indicated that the increased level of correlation in the pooled male-female sample was to some degree artificial, in most instances resulting from the distance between the male and female means rather than an overall pattern of covariance. A general exception to this is found in the variables correlated with mandibular length which show a large overlap between the male and female ranges and an increase in covariance in the pooled sample.

Summary (positive correlations greater than .39)

(I90) Symphyseal height: correlated with symphyseal thickness, corpus height, bicondylar breadth, mandibular length, ramus height, ramus minimum breadth and the width of the dental arch.

(I91) Symphyseal thickness: correlated with symphyseal height, mandibular length, ramus height and the width of the dental arch.

(I92) Corpus height: correlated with symphyseal height, mandibular length, ramus height, maximum and minimum ramus breadth and the width of the dental arch.

(I93) Corpus thickness: correlated with bigonial breadth, ramus minimum breadth and the width of the dental arch.

(I94) Bicondylar breadth: correlated with bigonial breadth, mandibular length and the maximum breadth of the ramus.

(I95) Bigonial breadth: correlated with bicondylar breadth and the length of the mandible.

(I96) Mandibular length: correlated with symphyseal height, symphyseal thickness, corpus height, bicondylar breadth, bigonial breadth, ramus height, minimum and maximum ramus breadths and the width of the dental arch.

(I97) Ramus height: correlated with symphyseal height, symphyseal thickness, corpus height, mandibular length, ramus minimum breadth, condyle breadth and the width of the dental arch.

(I98) Maximum ramus breadth: correlated with corpus height, bicondylar breadth, mandible length and minimum ramus breadth.

(I99) Minimum ramus breadth: correlated with symphyseal height, corpus height, corpus thickness, mandibular length, ramus height and the maximum breadth of the ramus.

(I100) Condyle length: no correlations greater than .39.

(I101) Condyle breadth: no correlations greater than .39.

(I102) Dental arch breadth: correlated with symphyseal height, symphyseal breadth, corpus height, corpus thickness, mandibular length and the height of the ramus.

Discussion

Pearson and Davin (1924) distinguished between 'spurious' and 'organic' correlations in their examination of the levels of correlation between cranial variables. They demonstrated that the presence of common components in two indices produced a 'spurious' correlation between the index variables. Solow (1966) was able to quantify the expected levels of correlation between cranial measurements sharing common reference points or covering similar anatomical regions. He distinguished between 'topographical' (variables sharing common reference points) and 'non-topographical' correlation (coordinated variation of reference points that are not common to both variables).

An observed correlation between variables that are not topographically related, with no reference point in common, may be considered to reflect a biological coordination (Solow, 1966:24).

Brown's (1973) factor analysis of Australian Aboriginal crania paid particular attention to the 'spurious' correlation between variables covering the same anatomical region. With the variables used in the present analysis a moderate level of 'spurious' correlation is to be expected as several measurements cover the same anatomical region. Cases of this sort are:

Symphyseal height and corpus height: these two variables measure the same general anatomical region, the height of two parts of the corpus from the inferior to its superior border. It is not surprising therefore that high levels of correlation were found between these two variables in each of the three matrices.

Symphyseal thickness and corpus thickness: these two dimensions measure a related anatomical region, the thickness of different parts of the corpus. These two regions are, however, differentiated anatomically by a number of apparently unrelated anatomical features which influence the breadth of the corpus at these points (size of the mental trigone, development of the lateral prominence, size and morphology of the mylohyoid ridge). The only high correlation between these two variables is in the female sample, indicating that to some extent these variables cover separate anatomical regions.

Bicondylar breadth, bigonial breadth and dental arch breadth: just as there is an obvious morphological association between breadths of the zygomatic arches and cranial vault, brought about by their anatomical relationship (Brown, 1973:42) a similar correlation could be expected between these mandibular variables. Bicondylar and bigonial breadths were moderately

correlated in the male and pooled samples. The development of ramus breadth at gonion is influenced by the development of the masseter muscle and its areas of attachment. This may result in a lower than expected correlation between bigonial and bicondylar breadth. Dental arch breadth was not highly correlated with these two variables in any of the matrices. Dental arch breadth appears to be an independent measure of breadth, unrelated to the bicondylar and bigonial dimensions. It is apparent that individuals with broad mandibular dental arcades do not have necessarily great posterior breadth in the mandible.

Maximum and minimum ramus breadths: these two variables cover a related anatomical region and some spurious correlation is expected. High levels of correlation were found between these two variables in the Murray Valley male and pooled samples.

The broadly allometric relationship of the mandibular dimensions is apparent from the pooled sex sample. With increasing mandibular length there is an increase in symphyseal and corpus height, the rami increase in height and breadth and there is an increase in the posterior breadth of the mandible. Only two variables (condyle length and breadth) have levels of correlation below .39 with all the other variables. In part this results from an inadequate measurement scale, resulting in a clustering of the condyle dimensions around a few points.

Both bicondylar and bigonial breadths have lower levels of correlation with the other mandibular variables than does mandibular length. It is possible for a mandible to be relatively small in terms of length and the dimensions of the corpus and ramus but have relatively great posterior breadth.

Mandibles with relatively great length and proportionally small posterior breadth were also apparent. Bigonial and bicondylar breadth, and to a lesser extent mandibular length, are found to have higher levels of correlation with cranial size than the other mandibular variables, Appendix 4, 5 and 6.

Coobool Creek

To maximise the use of the Coobool Creek data the male and female mandibles were pooled and a pairwise deletion method employed when calculating the correlation coefficients. However, for purposes of Pearson's correlation the sample is still extremely small ($n = 3-20$) and too much emphasis should not be placed on the results. Fifteen correlations are significant at the .05 - .001 level. The most significant positive correlation ($n = 12$, $r = .82$, $P = .001$) is that between minimum and maximum ramus breadths, followed by the correlation between symphyseal and corpus height ($n = 19$, $r = .62$, $P = .002$). There are 16 negative correlations, the highest ($n = 11$, $r = -.58$, $P = .029$) for the correlation between mandibular length and the height of the ramus. The remaining negative correlations are not significant at the .05 level (Table 25).

Summary (correlations significant at the .05 - .001 level)

(I90) Symphyseal height: correlated with corpus height, maximum and minimum ramus breadths.

(I91) Symphyseal thickness: correlated with bigonial breadth, ramus height, maximum ramus breadth, minimum ramus breadth and dental arch breadth.

(I92) Corpus height: correlated with symphyseal height.

(I93) Corpus thickness: correlated with minimum ramus breadth.

- (I94) Bicondylar breadth: no significant correlation.
- (I95) Bigonial breadth: correlated with minimum ramus breadth.
- (I96) Mandibular length: no significant correlation.
- (I97) Ramus height: no significant correlation.
- (I98) Maximum ramus breadth: correlated with symphyseal height, symphyseal thickness and minimum ramus breadth.
- (I99) Minimum ramus breadth: correlated with symphyseal height, symphyseal thickness, corpus thickness, maximum ramus breadth and bigonial breadth.
- (I100) Condyle length: no significant correlation.
- (I101) Condyle breadth: correlated with corpus thickness and condyle length.
- (I102) Dental arch breadth: correlated with symphyseal thickness and condyle length.

In interpreting the Coobool Creek mandibular correlation coefficients it should be noted that the sample consists of 13 reasonably complete male mandibles and seven more fragmentary female mandibles. To some extent, the reduced input from the smaller female mandibles will lessen the increase in correlation resulting from the distance between the male and female clusters in pooled samples. Even within the limitations of this analysis it is apparent that one of the Coobool Creek correlation series is unusual. In the Murray Valley matrices there is a high correlation (especially in the pooled sample) between mandibular length and the other variables. In the Coobool Creek matrix there are no significant positive correlations between the length of the mandible ($n = 11$) and the remaining variables. An examination of the Coobool Creek raw data indicates the complete lack of correlation between mandibular length and symphyseal height, corpus height and ramus breadth. Coobool Creek mandibles with a mandibular length at the lower end of the Coobool size range (CC10, mandibular length

104 mm, symphyseal height 39 mm) may have a symphyseal height greater than a mandible at the upper end of the Coobool size range for mandibular length (CC16, mandibular length 125 mm, symphyseal height 38 mm). There is simply no pattern to the association between mandibular length and the other mandibular dimensions in the Coobool Creek mandibles. An exception to this is the significant negative correlation between the length of the mandible and the height of the ramus ($n = 11$, $r = -.58$, $P = .029$).

3.4 Discriminant analysis

The small size of the female sample in both the Coobool Creek and Broadbeach series resulted in the discriminant analysis being confined to the male samples. Analysis of the distribution of the mandibular variables using the Shapiro-Wilk statistic (W) indicated that the distribution of the majority of the mandibular variables did not differ significantly from the normal curve. Variables with a significant value for W in the male mandible sample were symphyseal thickness and condyle length in the Murray Valley sample and condyle length and breadth in the Broadbeach series. An examination of the raw data and the plots associated with the W statistic indicated that the distribution of each of these variables was platykurtic. This appears to be a function of inadequate measurement scale resulting in the clustering of the measurements around too few points. It would have been more appropriate to measure these dimensions to a fraction of a millimeter, rather than the nearest millimeter. These three variables were excluded from the discriminant analysis. In addition, the examination of the correlation matrices indicated the high correlation between symphyseal height and corpus height. Both these variables cover a closely related anatomical region, so corpus height was considered redundant.

The other major criterion influencing variable selection was preservation. All the mandibular data sets are incomplete. Although there are procedures which substitute data for missing values (most commonly the mean of the actual observations), I wished to restrict the analysis to real data. In order to maximise the number of mandibles included in the analysis, variables were selected which had a high incidence of preservation. The selected variables are symphyseal height, corpus thickness, mandibular length, ramus height, minimum ramus breadth and dental arch breadth. The selection of these six variables reduced the size of the sample to Murray Valley (n = 36), Coobool Creek (n = 9), Swanport (n = 10) and Broadbeach (n = 15).

A series of two-group discriminant analyses were performed using a stepwise procedure which maximised the Mahalanobis distance (D^2) between groups. This was followed by a four-group comparison. For a discussion of the stepwise selection procedure and discriminant analysis in general see Section 2. The purpose of the two-group analyses was to maximise the descriptive information that could be recovered. Also the interpretation of several statistics associated with the discriminant procedure is more straightforward when there are only two groups included, with only one function produced. To gain some idea of the extent of within-population variation the initial discriminant analysis was between male and female mandibles from the Murray River Valley. This interpopulation variation could then be contrasted with that found between the male populations. Covariance matrices were generated for each group and a test for equality of the matrices (Box's M) employed. Mahalanobis distance, eigenvalues, Wilks Lambda, probabilities of misclassification and plots of the discriminant scores were examined for each group.

Results

Homogeneity of covariance was tested in each of the discriminant runs using Box's M. In each comparison the F values were not significant at the 5 percent level indicating that the dispersion in each of the groups is equal (Table 26).

TABLE 26: Test for the equality of the group covariance matrices

	Box's M	F	Degrees of freedom	P
Murray Valley ♂-Murray Valley ♀	0.2405	1.0454	21, 19658.6	0.4022
Coobool Creek-Murray Valley	0.2367	0.7854	21, 773.2	0.7397
Coobool Creek-Swanport	0.3067	0.8821	21, 1032.9	0.6153
Coobool Creek-Broadbeach	0.1689	0.5298	21, 1042.8	0.9594
Murray Valley-Swanport	0.2717	0.9463	21, 1005.2	0.5298
Murray Valley-Broadbeach	0.1717	0.6738	21, 2793.5	0.8625
Swanport-Broadbeach	0.2068	0.6794	21, 1362.5	0.8567
CC-MV-SW-BB	0.6697	0.7980	63, 2777.6	0.8750

Murray Valley males and females

Although the variables included in this analysis were not selected for their ability to discriminate between male and female mandibles, a high level of discrimination was obtained in this comparison. The classification results indicate that 80.6 percent of the male mandibles and 85.0 percent of the female mandibles were correctly classified by the function. There is, however, a large area of overlap between the male and female distributions and little distance between the respective group centroids (Figure 8).

The major discriminating variables between these two groups are symphyseal height, ramus height and minimum ramus breadth (Table 27).

Table 27. Standardised canonical discriminant function coefficients for the two-group analyses

	MV♂-MV♀	CC-MV	CC-SW	CC-BB	MV-SW	MV-BB	SW-BB
Symphyseal height	-0.577	-0.488	0.680	0.786	0.817	-1.019	0.374
Corpus thickness	0.201	0.147	0.570	-0.084	-0.357	0.771	0.825
Mandibular length	-0.118	0.308	0.456	-0.222	0.401	0.780	0.962
Ramus height	-0.422	-0.246	-0.055	0.487	-0.779	0.031	-0.490
Min. Ramus breadth	-0.314	-0.435	-0.328	0.242	0.113	-0.329	-0.796
Dental arch breadth	-0.196	-0.711	0.438	0.726	-0.002	-0.147	0.169

Table 28. Eigenvalues, canonical correlations and Wilks Lambda for the eight discriminant analyses

	Eigenvalues	% variance	canonical correlation	Wilks Lambda	Chi-squared	DF	P
Murray Valley ♂-Murray Valley ♀	1.170	100	0.734	0.460	55.013	6	0.0000
Coobool Creek-Murray Valley	0.720	100	0.647	0.581	21.699	6	0.0014
Coobool Creek-Swanport	5.054	100	0.913	0.165	25.210	6	0.0003
Coobool Creek-Broadbeach	2.918	100	0.863	0.255	25.950	6	0.0002
Murray Valley-Swanport	1.587	100	0.783	0.386	38.972	6	0.0000
Murray Valley-Broadbeach	0.696	100	0.640	0.589	24.321	6	0.0005
Swanport-Broadbeach	3.478	100	0.881	0.223	29.998	6	0.0000
CC-MV-SW-BB							
Function 1	1.056	54	0.716	0.235	92.473	18	0.0000
Function 2	0.579	30	0.605	0.484	46.343	10	0.0000
Function 3	0.306	16	0.484	0.765	17.102	4	0.0018

There appears to be little sex-based dimorphism within this population in the length of the mandible and the breadth of the dental arch. An examination of the univariate data for these groups suggests that if either bigonial or bicondylar breadth had been included, this would have increased the distance between the male and female centroids.

Coobool Creek and Murray Valley

The canonical discriminant functions calculated from the six mandibular variables correctly predicted the group membership of 86.1 percent of the Murray Valley sample and 77.8 percent of the Coobool series (Figure 9). The overall accuracy of 84.4 percent is slightly higher than that obtained with the Murray Valley males and females (82.8 percent). The second lowest eigenvalue and canonical correlation were associated with this function, indicating the relative closeness of the two variable sets defining group membership (Table 28). Some similarity of the Coobool Creek and Murray Valley mandibles is to be expected given that they come from the same general geographical area and there is a lack of temporal control in both samples.

The standardised coefficients indicate that the principal discriminating variable was the breadth of the dental arch, followed by symphyseal height and minimum ramus breadth. The univariate results demonstrate that the Coobool Creek means are significantly greater than the Murray Valley mean values for each of these dimensions ($P = .025 - .000$). Two Coobool Creek mandibles (CC45 and CC49) fall within the range of the Murray Valley mandibles as defined by the variables. The Coobool Creek mandible at the greatest distance from the Murray Valley group centroid is CC46. Only two Kow Swamp mandibles (KS1 and KS5) were complete enough to be included in this analysis.

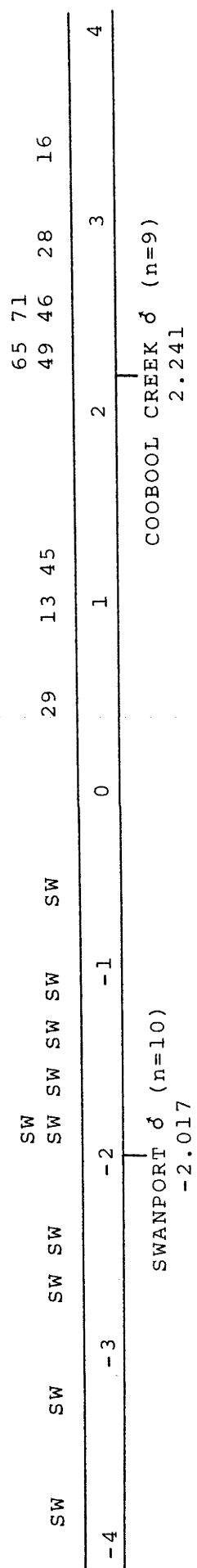


Figure 10. Canonical discriminant function score distribution, Swanport males and Coobool Creek males

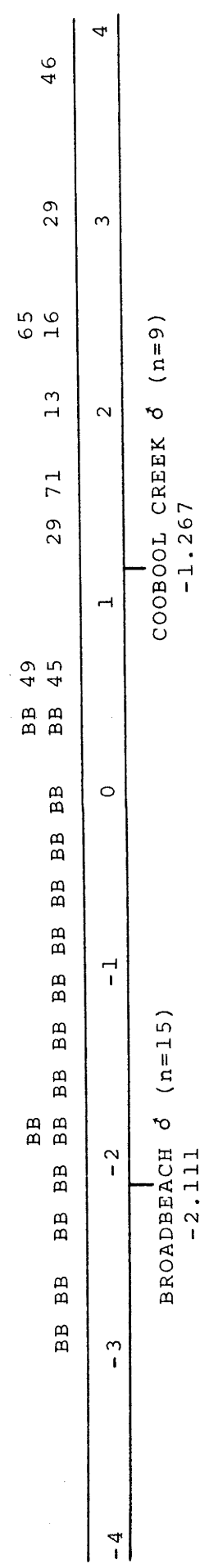


Figure 11. Canonical discriminant function score distribution, Broadbeach males and Coobool Creek males

Both of these mandibles fall within the Coobool Creek range of variation and they are both distinct from the Murray Valley sample (Figure 9).

Coobool Creek and Swanport

The canonical discriminant function calculated in this analysis clearly distinguished between the two groups, with a wide separation of the group centroids and 100 percent correct classification (Figure 10). The ability of the function to discriminate between the Coobool Creek and Swanport mandibles is indicated by its high eigenvalue and canonical correlation (Table 28). The distance between the group centroids in this analysis is greater than that between the Murray Valley males and females and there is no overlap in range. These two samples were the most easily differentiated pair in the analysis.

Within the range of variation defined by the univariate statistics these two groups represent opposing morphometric extremes for a number of variables. The standardised coefficients indicate that the most important discriminator is symphyseal height, with corpus thickness, mandibular length and dental arch breadth being slightly less important (Table 27).

Coobool Creek and Broadbeach

The results of this analysis are similar to the Swanport-Coobool Creek comparison, with the plot of the canonical discriminant function scores displaying the wide separation of the group centroids (Figure 11). The probabilities of misclassification indicate that 100 percent of the Coobool Creek and Broadbeach mandibles were correctly identified by the final function. A comparison of these results with the Swanport-Coobool Creek data indicate that the group centroids are closer in this analysis and this is reflected in the lower eigenvalue associated with the function (Table 28). This is a product of the larger size of the Broadbeach mandibles relative to those

from Swanport, with greater symphyseal height, mandibular length and dental arch breadth.

Symphyseal height, dental arch breadth and ramus height are the major discriminators in this function, with the remaining variables being far less important (Table 27). The Coobool Creek mean values for the three major discriminating variables are significantly greater than the Broadbeach means ($P = .002 - .000$).

Murray Valley and Swanport

A surprisingly high level of discrimination was achieved in this analysis, with the final function correctly predicting the group membership of 91.7 percent of the Murray Valley sample and 100 percent of the Swanport series. There is little overlap in the ranges of the two groups as defined by the discriminating variables, with moderate separation of the group centroids (Figure 12).

The standardised functions indicate that there are three major discriminating variables in the analysis: symphyseal height, ramus height and mandibular length (Table 27). The Swanport mandibles combine a symphyseal height and mandibular length which are at the lower end of the Australian range with a ramus height which exceeds that recorded for most other populations. Students *t* indicates that the differences between the mean values, at Swanport and the Murray Valley, for the three primary discriminators are significant ($P = .001 - .000$).

Murray Valley and Broadbeach

Of the groups included in these analyses these two were the most similar. Even so the canonical function correctly predicted the group membership of 83.3 percent of the Murray Valley sample and 73.3 percent of the Broadbeach series. There is a moderate degree of overlap in the distribution of the two groups, with less distance between the group centroids than in the other analyses (Figure 13). The lowest eigenvalue and canonical correlation are associated with this function; however, Wilks Lambda and its associated Chi Square are still significant (Table 28).

The major discriminating variable is symphyseal height, with corpus thickness and mandibular length being slightly less important (Table 27). The difference between the Murray Valley and Broadbeach means is significant for only one of the discriminating variables, symphyseal height ($P = .006$).

Swanport and Broadbeach

There is a wide separation of the group centroids formed by the function, with only a small overlap between the distributions of the two groups (Figure 14). A large eigenvalue and canonical correlation indicate the relative importance of this function, with 90 percent of the Swanport mandibles and 100 percent of the Broadbeach mandibles being correctly classified (Table 28). The standardised coefficients demonstrate that the three major discriminating variables (mandibular length, ramus breadth and corpus thickness) discriminate between these groups fairly equally (Table 27). The univariate results indicate that the differences between the mean values for mandibular length and minimum ramus breadth in these groups are significant ($P = .012 - .000$). The Broadbeach mandibles combine a mandibular length which is at the top of the Australian range with relatively narrow rami. The Swanport mandibles are short with relatively broad and high rami.

Coobool Creek, Murray Valley, Swanport and Broadbeach

The purpose of the four-way comparison was an examination of the matrix of pairwise F ratios, distance between group centroids and the probabilities of misclassification. The matrix of pairwise F ratios consists of an F ratio for each pair of groups (Table 29). This F is the significance test for the Mahalanobis distance between groups and these F's can be used to test the equality of pairs of centroids (Nie, *et al.*, 1975:460). F ratios are calculated at each stage of the stepwise procedure and alter with the inclusion of each new variable. The final F ratio indicates the significance of the total Mahalanobis distance between pairs.

TABLE 29: F statistic and significance between pairs of groups

	Murray Valley	Coobool Creek	Swanport
Coobool Creek	F 5.1919 P 0.0002		
Swanport	F 8.5838 P 0.0000	9.5574 0.0000	
Broadbeach	F 4.5473 P 0.0007	7.7053 0.0000	6.1921 0.0000

The F statistics indicate that the closest groups in the analysis are the Murray Valley and Broadbeach mandibles, followed by Murray Valley and Coobool Creek and Broadbeach and Swanport. The most distant pairs in the analysis are Coobool Creek and Swanport and Murray Valley and Swanport (Table 29).

The group classification results (Table 30) indicate that the most distinctive mandibles in the analysis come from Swanport, with the discriminant procedure correctly predicting the group membership of 100 percent of the Swanport mandibles. This was followed by Broadbeach (73.3 percent), which has a 26.7 percent overlap with the Murray Valley, and Coobool Creek (66.7 percent), with one mandible being allocated to each of the other samples.

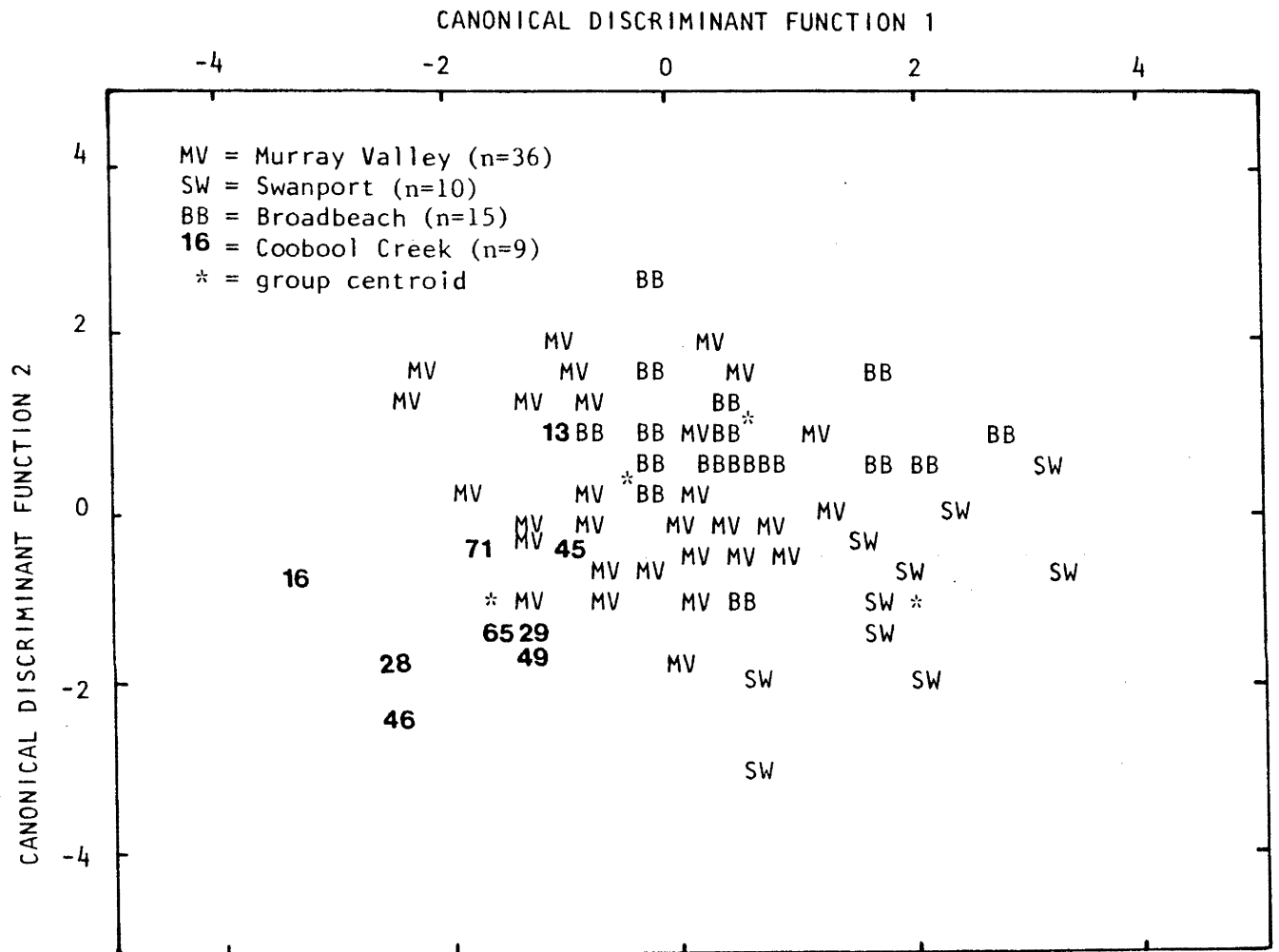


Figure 15. Canonical discriminant analysis of Australian Aboriginal male mandibles from the Murray Valley, Swanport, Broadbeach and Coobool Creek, all groups scatterplot.

Sixty-one percent of the Murray Valley mandibles were correctly classified, with the remainder being spread evenly between the other populations. A plot of the discriminant function scores (Figure 15) indicates the closeness of the Murray Valley and Broadbeach centroids, the Coobool Creek and Swanport centroids being more distinct.

TABLE 30: Group classification results

Actual group	n.	Predicted group membership			
		MV	CC	SW	BB
Murray Valley	36	22 61.1%	5 13.9%	3 8.3%	6 16.7%
Coobool Creek	9	1 11.1%	6 66.7%	1 11.1%	1 11.1%
Swanport	10	0 0.0%	0 0.0%	10 100.0%	0 0.0%
Broadbeach	15	4 26.7%	0 0.0%	0 0.0%	11 73.3%

Discussion

Multivariate and univariate analyses of Australian Aboriginal crania have detailed the marked regional variation in size and morphology throughout the continent (Larnach and Macintosh, 1965, 1966, 1970; Thorne, 1975; Giles, 1976; Pietrusewsky, 1979). However, comparable analyses of Australian Aboriginal mandibles are few, with detailed observations limited to those of Klaatsch (1908), Murphy (1957), Larnach and Macintosh (1971) and Freedman and Wood (1977). Although restricted by a lack of published comparative data, Freedman and Wood's univariate analysis of the Broadbeach mandibles indicated that these mandibles formed a distinct local population which could be distinguished both from other Queensland samples and from mandibles from coastal New South Wales.

The results of the present univariate and discriminant analysis demonstrate that regional variation, at a similar level to that described for Australian Aboriginal crania, is also present in the mandibles. The distances between several populations (Coobool Creek and Swanport, Swanport and Broadbeach, Coobool Creek and Broadbeach, Murray Valley and Swanport) exceed the interpopulation, sex-based variation found within the Murray Valley sample. Canonical discriminant functions calculated from the Coobool Creek, Murray Valley, Swanport and Broadbeach mandibles are able to distinguish between these series with an accuracy ranging from 77-100 percent in two-way comparisons and 61-100 percent in the four-way comparison.

The most distinctive mandibles in the discriminant analysis are the Swanport series. The major variable distinguishing these mandibles from the Murray Valley, Broadbeach and Coobool Creek mandibles is mandibular length. The Swanport mandibles combine a mandibular length at the lower end of the Australian range with a low corpus and absolutely large rami. Although having an absolutely short mandibular length, the Swanport mandibles have dental arches which are as broad as the longer Murray Valley and Broadbeach mandibles.

The Murray Valley mandibles can best be described as occupying the middle ground. For a number of variables (corpus thickness, mandibular length, ramus breadth, dental arch breadth) the Murray Valley means fall closer to the overall sample means than do the Swanport, Broadbeach and Coobool Creek mandibles. The classification results of the four-way comparison indicate that the lowest level of predicted group membership was gained with the Murray Valley sample, with 39 percent of the Murray Valley sample evenly distributed between the other three groups. The major distinguishing feature of the Murray Valley mandibles is their great symphyseal

height, which differentiates them from the other modern samples, Broadbeach and Swanport.

The Broadbeach mandibles also occupy an intermediate position in the discriminate analysis, with their range of variation overlapping that of the Murray River Valley. The variable distinguishing the Broadbeach mandibles from the Murray Valley, Swanport and Coobool Creek mandibles is mandibular length. The Broadbeach mandibles are at the top of the Australian range for this dimension but do not combine this with either relatively large rami or broad dental arches.

Temporal variation is indicated by the comparison of the Coobool Creek and Kow Swamp mandibles with the recent Murray Valley series. The Coobool Creek mandibles are distinguished from the other samples by their high symphyses and great dental arch breadths. This great symphyseal height and dental arch breadth combine with a mandibular length which appears short for the mandibular breadth and with rami which are both broad and high. The univariate results indicate that if bigonial breadth had been included in the analysis (not included because it is preserved in too few specimens), the distance between the Coobool Creek mandibles and the other populations would have been increased.

The results of the discriminant analysis demonstrate that the Coobool Creek mandibles cluster most closely with the Murray Valley series. This is to be expected given that both samples come from the same geographical area. The two Kow Swamp mandibles complete enough for inclusion in the discriminant analysis (KS1 and KS5) fall within the range of the Coobool Creek mandibles and are outside the range of the Murray Valley, Swanport and Broadbeach mandibles. It should be noted that while there is an overlap in the

range of the Coobool Creek and Murray Valley mandibles, this overlap is not as great as that between the Broadbeach and Murray Valley mandibles. Therefore, in this instance, the temporal variation within the Murray Valley exceeds the regional variation as defined by the Murray Valley and Broadbeach samples. Both the Coobool Creek and Kow Swamp mandibles can be distinguished from the Murray Valley mandibles by their symphyseal height, ramus breadth and dental arch breadth. The univariate results demonstrate that the Coobool Creek mean values for each of these variables are significantly greater than the Murray Valley means ($P = .025 - .000$).

Correlation matrices produced with the Murray Valley data suggest possible allometric associations between mandibular length and the dimensions of the corpus (symphyseal height, symphyseal thickness, corpus height and corpus thickness). However, no significant correlation could be found between symphyseal height and mandibular length in the Coobool Creek sample. The Coobool Creek sample is small and the possible allometric association of these variables should not be excluded due to the possibility of sample bias.

SECTION 4

THE COOBOOL CREEK CRANIA

4.1 Morphological and univariate description and comparison

In the post-Darwinian rush to elucidate the evolutionary sequence linking *Homo sapiens* with the common ancestor of the Hominoidea, considerable attention was focused on the apparently 'primitive' features of Australian Aboriginal crania (Huxley, 1864; Topinard, 1872; Turner, 1884; Hartman, 1885; Schoetensack, 1901; Klaatsch, 1908). From this initial work has arisen a large descriptive and comparative literature on Australian crania.

The non-metric, morphological characteristics of Australian crania have been extensively described, with the recent work of Larnach and Freedman (1964), Larnach and Macintosh (1966 and 1970) and Thorne (1975) stemming from the pioneering studies of Klaatsch (1908) and Fenner (1939). Initially the emphasis of these studies was purely descriptive (Klaatsch, 1908; Krogman, 1932; Fenner, 1939), with little attention to internal geographic differentiation. In recent work (Larnach and Macintosh, 1966, 1970; Kellock and Parsons, 1970; Thorne, 1975) there has been an emphasis on regional, temporal and sex-based variation in Aboriginal cranial morphology.

Historically the emphasis of the craniometric studies have followed a similar pattern to the morphological analyses. The initial emphasis was descriptive, with Klaatsch (1908) reporting the metrical characteristics of 87 crania from Queensland. Morant (1927) combined data from previous

studies in his comparison of Tasmanian and Australian crania. During the same period Hrdlička (1928) published a classic metrical survey of nearly 1000 crania from the Departments of Anatomy and Museums in Sydney, Melbourne, Adelaide and London. Hrdlička's data demonstrated the presence of both regional and sex-based variation in Aboriginal cranial morphology.

With recent univariate and multivariate analyses there has been an increasing concentration on aspects of regional and temporal variation (Freedman, 1964; Brown, 1973; Thorne, 1975, 1976, 1977; Freedman and Wood, 1977; Margetts and Freedman, 1977; Pietrusewsky, 1979; Thorne and Wolpoff, 1981). However, functional statements are largely restricted to analyses of the oro-facial complex, with an extensive series of papers resulting from the long-term growth study of the Walbiri and Pintubi people of Yuendumu conducted by scholars at the University of Adelaide (Barrett, *et al.*, 1963a; Barrett, *et al.*, 1965; Brown and Barrett, 1973; Brown, 1973).

For purposes of morphological comparison I have been strongly influenced by the work of Klaatsch (1908), Fenner (1939), Larnach and Macintosh (1966, 1970) and Thorne (1975). My general approach is similar to that taken with the Coobool Creek mandibles. Rather than attempt to compare the development of the continuous morphological features in the Coobool Creek crania with the graded data published for other Australian series, I make continual reference to 60 Aboriginal crania (30 males and 30 females) from Euston in the central Murray River Valley. The Coobool Creek crania were compared also with those from Kow Swamp (Thorne, 1975).

Using the statistical procedures outlined in Section 3, metrical comparisons are made between the Coobool Creek crania and those from the Murray Valley, Swanport, Broadbeach and Kow Swamp samples, using the variables described in Section 1. The descriptive and comparative statistical

data for these crania are presented in Tables 46-58. Due to the small size of the Broadbeach female sample (n=4), these crania will not be compared with those in the other female samples. Lateral and frontal views of the Coobool Creek crania and occlusal views of the palates are presented in Plates 1-32.

Morphologically and metrically the Coobool Creek crania are distinguished by their extreme variability. To some extent this variability is a function of artificial deformation (Brown, 1981b) and the morphological and metrical features associated with this process will be examined in Section 4.2.

The frontal bone

The glabella region is preserved in all of the reconstructed Coobool Creek crania and its prominence was graded using the scale developed by Martin and Saller (1957, Figure 536) (Table 31). The frontal bones combine a typically low and broad glabella region with only moderate depression of the nasal root. The glabellae do not exhibit the inflated, prominent appearance of many modern Aboriginal male crania.

TABLE 31: Glabella prominence

Class 1.

Class 2. CC1*, CC7*

Class 3. CC2*, CC8, CC9*, CC10, CC12*, CC13, CC16, CC18*, CC49, CC58*

Class 4. CC5, CC28, CC29, CC35, CC36, CC37, CC41, CC45, CC65, CC66

Class 5. CC46, CC71

Class 6.

* female crania

The prominence of the superciliary ridges and zygomatic trigones were scored according to the grades defined by Larnach and Freedman (1964). There is considerable sex-based dimorphism in the development of these features in Australian Aboriginal crania, with some slight regional variation (Brown, 1981a). The superciliary ridges in the Coobool Creek crania do not reach the maximum development seen in the comparative Euston crania. The Coobool Creek superciliary arches are generally elongated and parallel with the upper margin of the orbit, rather than arching superiorly away from the orbital margin as they progress laterally (Table 32).

TABLE 32: Superciliary ridge prominence

Class 1. CC1*, CC2*, CC7*, CC9, CC10, CC29, CC50*

Class 2. CC5, CC12*, CC13, CC18*, CC28, CC41, CC49, CC65, CC66, CC71

Class 3. CC8, CC16, CC35, CC36, CC37, CC45, CC46

* female crania

One of the distinctive features of frontal bones from the Murray River Valley (especially those of males) is the prominence of the zygomatic trigones. These often develop into large globose structures with marked lateral development. Development of the trigones in the Coobool Creek frontals varies with sex. Maximum development of the trigones is found in CC16 and CC29 where it exceeds the Euston maximum (Table 33).

TABLE 33: Zygomatic trigone development

Class 1. CC1*, CC7*, CC18*

Class 2. CC2*, CC8, CC9*, CC10, CC36, CC45

Class 3. CC5, CC12*, CC13, CC16, CC28, CC29, CC35, CC37, CC41, CC49,
CC50*, CC65, CC66, CC71

* female crania

The combination of glabella, superciliary ridges and zygomatic trigones form the supraorbital torus (Cunningham, 1908). Cunningham presents a detailed description of the morphology of the supraorbital region in primate crania. He subdivides the torus into three distinct types.

Type 1: The three elements of the supraorbital region are distinct and separate, with each superciliary ridge separated by a shallow median depression from glabella.

Type 2: The superciliary ridges and glabella are continuous as a single unit. On the outer side of the supraorbital notch the superciliary ridges extend outwards with a varying degree of prominence and for a varying distance towards the trigones. From the latter it is separated by a faint groove which ascends obliquely upwards and outwards from the supraorbital notch.

Type 3: All three elements are fused to form a continuous arch, the *torus supraorbitalis*, which extends from glabella to the fronto-malar suture.

Larnach and Macintosh (1966) found that in Aboriginal crania there was a need for an intermediate category (pseudo torus) between Cunningham's classes 2 and 3. In this transition type

the floor of the sulcus supraorbitalis is pushed up by the fused projections of the superciliary and trigonal elements, but on closer examination it can be observed crossing the pseudo-torus from the supraorbital notch (Larnach and Macintosh, 1966:15).

In assessing the development of the supraorbital torus the important factor is continuity of the individual elements rather than size.

Fenner (1939) and Larnach and Macintosh (1966) found that the majority of the Aboriginal crania they examined could be classified as Cunningham's class 2.

A similar result was obtained with the Coobool Creek crania (Table 34). Two crania in the Coobool Creek series (CC28 and CC36) displayed definite continuity of the three supraorbital elements and were classified as class 3 (true torus). Thorne (1975) found that three of the Kow Swamp crania (KS1, KS8 and KS15) displayed a true supraorbital torus.

TABLE 34. Supraorbital torus development

Cunningham type 1.

Cunningham type 2. CC1*, CC9*, CC12*, CC13, CC29, CC45, CC46, CC49, CC65

Pseudo torus. CC16, CC41, CC66, CC71

Cunningham type 3. CC28, CC37

* female crania

A supraglabella fossa of variable development is present in all the frontal bones, with the exception of CC29. In this individual a broad and low median ridge extends from the middle third of the frontal downwards towards glabella, where it expands into a broad triangular field. This results in a continuous ridge running backwards from glabella towards bregma.

When present the supraglabella fossa generally extends backwards and laterally into an ophrionic groove, which may extend to the temporal crests. Two features, the height of the superciliary ridges and the development of the frontal eminence, influence the depth of the ophrionic groove. In comparison with the Euston male crania, the depth of this groove varies from extremely shallow (CC29 and CC49) to deep (CC37).

Both supraorbital grooves and foramina occur in the reconstructed Coobool Creek crania. Bilateral notches are present in 14 of the 16 reconstructed crania (87.5 percent), with bilateral foramina in CC71 and a unilateral foramen in CC46. In both size and morphology the Coobool Creek supraorbital grooves fall within the range of the comparative Euston sample.

Laterally, the development of the temporal crests is variable with extremely prominent crests in the male CC16. In this individual the crests form pronounced broad ridges running from the fronto-malar to the coronal suture. They become less prominent on the parietals. On the medial side of the temporal ridges in this individual are extended, deep grooves running parallel with the temporal ridge along the middle third of the frontal bone. With the exception of this individual, the degree of development of the temporal lines in the Coobool Creek crania is within the range of the Euston series.

Klaatsch (1908) and Fenner (1939) describe the form of the median frontal ridge in Australian Aboriginal crania. Fenner noted that in its

extreme development it passes up from a strong glabella as a prominent rounded ridge on the frontal bone, obliterating the supraglabella fossa. It may end at bregma or may pass back as a prominent ridge on the anterior part of the parietal bones (1939:251).

The development of the median ridge in the Coobool Creek frontals is graded relative to the average of the combined Euston sample (Table 35). A median frontal ridge is present in 11 of the Coobool Creek crania, with a maximum development in CC37.

TABLE 35: Median frontal ridge development

Absent	CC9*, CC10, CC65, CC66, CC71
Slight	CC1*, CC12*, CC13, CC41, CC46, CC49
Medium	CC16, CC28, CC29, CC45
Marked	CC37

* female crania

Klaatsch (1908) noted that in the Indonesian *Homo erectus* crania the median ridge ended in a pronounced raised area of bone anterior to bregma, the prebregmatic eminence. A prominent prebregmatic eminence is present in Coobool Creek crania CC65 with a slight development of this feature in CC1, CC12 and CC29. A prominent prebregmatic eminence is also evident in Kow Swamp 7 and Cohuna (Brown, 1981b). This feature will be examined in the chapter on artificial deformation.

One of the major features distinguishing the Coobool Creek and Kow Swamp crania from modern Murray Valley crania is their great supraorbital breadth. Mean maximum supraorbital breadth in the Coobool Creek male and female samples is significantly greater than the male and female mean values in the Murray Valley and Swanport series ($P = .008-.000$). The Coobool Creek male mean, while greater than that for the Broadbeach males, is not significantly so ($P = .116$). There is considerable sex-based dimorphism in this dimension in Australian Aboriginal crania and the difference between the male and female means in each of the samples is significant ($P = .015-.000$). Maximum supraorbital breadth in the Coobool Creek sample (123mm for CC49) exceeds the maximum in the comparative series (120mm for Broadbeach) but is below the maximum recorded by Larnach and Macintosh (1970) for male crania from coastal New South Wales (126mm). The maximum supraorbital breadth at Kow Swamp is 122mm for KS7 (Thorne, 1975).

Larnach and Macintosh (1970) noted that in Queensland crania with prominent zygomatic trigones the lateral points of supraorbital breadth were often located on the projections of the trigones rather than on the frontomalar suture. In the 170 Victorian crania examined by Thorne (1975) 72 had the points of maximum supraorbital breadth located on the trigones. In five of the Coobool Creek crania (CC10, CC16, CC28, CC29, and CC65) maximum supraorbital breadth is located on the trigone.

This great supraorbital frontal breadth is also represented postorbitally in the Coobool Creek crania. The mean minimum frontal breadth in these crania is significantly greater than the Murray Valley and Swanport means ($P = .034-.013$). The Broadbeach male mean is slightly larger than the Coobool Creek male mean but this is not significant ($P = .563$). There is significant sexual dimorphism in this dimension in the Murray Valley sample ($P = .000$) but this is not reflected in any of the other samples ($P = .255-.081$). The maximum value for minimum supraorbital breadth in the Coobool Creek crania (109mm for CC49) is exceeded by the maximum in the Broadbeach series (110mm). The maximum recorded for this dimension in the Kow Swamp series is 106mm for KS7.

Thorne and Macumber (1972) indicate that in the Kow Swamp crania a poorly filled temporal region produces a high degree of postorbital constriction. Postorbital constriction is indicated by the difference between the maximum supraorbital breadth and the minimum postorbital diameter, when the latter is taken on the fronto-sphenoid suture (Larnach and Macintosh, 1970). An examination of postorbital constriction in the Coobool Creek, Kow Swamp and Murray Valley crania indicates that there is no significant difference between these populations for this dimension. Both the Coobool Creek (26mm for CC28 and CC71) and Kow Swamp (30mm for KS1) maxima for this dimension fall within the Murray Valley range (13-34mm) and there is no significant difference between the Coobool Creek and Murray Valley male means ($P = .250$). Larnach and Macintosh (1970) found that there is considerable sexual dimorphism in this dimension and this is supported by the significant difference between the Murray Valley male and female means ($P = .000$).

The nasal bones

The Coobool Creek nasal bones are exceptionally broad and flattened, with the waisted appearance typical of Aborigines. Larnach and Macintosh (1966, 1970) examining the breadth of the naso-frontal articulation in Aboriginal crania from Queensland and Coastal New South Wales, divided this dimension into three grades: narrow (under 10mm), medium (10-12mm) and broad (over 12mm). Fifty-one of the 234 crania they examined (22 percent) were classed as broad. In contrast to this 12 of the 13 Coobool Creek male crania for which this area is preserved (92.3 percent) have naso-frontal articulations broader than 12mm. The mean breadth of this feature in the Coobool Creek male crania is significantly greater than that in the comparative Euston series. The comparative statistics for the breadth of the naso-frontal articulation in these two samples are as follows:

	n	\bar{X}	s	Range	t	P
Coobool Creek ♂	13	13.7	2.26	8.6-16.5		
Euston ♂	27	12.1	2.03	8.3-15.1	2.13	0.025

Broad fronto-nasal articulations are also a feature of the Kow Swamp crania, with Thorne (1975) recording a maximum breadth of 17mm for KS4 and KS7. There is complete fusion of the internasal suture in Coobool Creek cranium CC49, with partial fusion in CC12, CC16, CC37, CC41, CC46 and CC66.

The zygomatic bones

The Coobool Creek zygomatic bones are distinct. They are typically extremely deep and robust structures, with prominent malar tuberosities and massive, thickened frontal processes.

The most distinctive feature of the Coobool Creek zygomatic bones is their great size. Zygomatic depth (the minimum distance between zygomaxillare and the inferior margin of the orbit) in the Coobool Creek male crania is significantly greater ($P=0.000$) than the mean in the Euston males. The maximum depth in nine of the 12 Coobool Creek male crania for which this dimension is preserved exceeds the Euston maximum, with a maximum of 31mm (CC49) for this dimension in the Coobool Creek series. The comparative statistics for zygomatic depth in these samples are:

	n	\bar{X}	s	Range	t	P
Coobool Creek ♂	13	26.0	2.61	22.0-31.0	6.46	0.000
Euston ♂	30	20.8	2.21	17.0-24.5		

The most prominent feature on the lateral surface of the zygomatic bone is the malar tuberosity. Fenner (1939:276) found that in Australian Aboriginal crania 'the malar tuberosity takes the form of a prominent ridge on the malar surface of the bone running parallel with the inferior border'. All of the malar tuberosities in the reconstructed Coobool Creek crania are of this form.

There is considerable sex-based dimorphism in the prominence of the malar tuberosity in Australian crania (Fenner, 1939; Larnach and Freedman, 1964; Brown, 1981a) and a similar degree of dimorphism is present in the Coobool Creek series. The malar tuberosities were graded using the procedure developed by Larnach and Freedman (1964). Fifty percent of the Coobool Creek male crania have large (class 3) malar tuberosities (Table 36).

TABLE 36: Malar tuberosity size

Class 1.	CC1*, CC2*, CC5, CC7*, CC9*, CC12*, CC28, CC50*
Class 2.	CC13, CC18*, CC40, CC41, CC45, CC49, CC71
Class 3.	CC10, CC16, CC29, CC36, CC37, CC46, CC65, CC66

* female crania

Variation in the size and depth of the masseteric attachment on the inferior border of the zygomatic bones is great. Although the fossae are often deep, broad and long, they are generally less rugose than the most rugged fossae in the Euston males. However, the actual area of attachment in the Coobool Creek crania is probably larger than that in the Euston series due to the great breadth of the inferior border of the bone. There is no apparent sex-based dimorphism in the development of the masseteric fossae in the Coobool Creek series as deep fossae are present in male and female crania. In CC37 the inferior border of the zygomatic bone is particularly thickened, with deep and rugose fossae.

Medially the masseteric fossa is bordered by the maxillomalar suture. The inferior border of this suture protrudes in 12 of the Coobool Creek crania (CC9, CC10, CC13, CC16, CC37, CC41, CC45, CC46, CC49, CC65, CC66 and CC71) forming a tubercle of varied development. Superiorly the middle third of the maxillomalar suture lies in a pronounced depression. Thorne (1975: 111) noted that this depression is produced by a thickening of the orbital border above and by an abrupt rise of the malar tuberosity posteriorly.

A distinctive feature of the zygomatic bones in the Coobool Creek and Kow Swamp crania is the size and morphology of the frontal process. These form broad and thickened structures with extremely pronounced marginal

processes. The marginal processes flare posteriorly and form a raised, globular area (analogous to the zygomatic trigone) below the fronto-malar suture. The maximum development of this process in the Coobool Creek and Kow Swamp crania exceeds the Euston series. The maximum development of this feature in the Coobool Creek crania is in the male crania CC37, CC49 and CC65, with minimal development in the female CC1. The maximum breadth of the marginal process in the Coobool Creek series ranges from 12 to 17mm. Thorne (1975) records a range of 12-20mm for the Kow Swamp crania.

The orbits

Fenner (1939:269) noted that 'the great cavernous orbits beneath over-hanging brows are one of the most striking features of the Australian facial skeleton'. He recorded variation in shape, from a low straight-sided rectangular form to an almost circular condition, and in the axis of orientation.

There is some variation in the form of the orbit in the Coobool Creek crania, but the predominant shape is a narrow rectangle with a horizontal to slightly oblique orientation (CC12, CC13, CC16, CC28, CC37, CC49 and CC65). Larger, more rounded orbits with a taller lateral margin are found in CC1, CC9, CC45 and CC66.

Coobool Creek orbital height is at the lower end of the Australian range, with a significant difference between the Coobool Creek male mean and the means of the comparative series ($P=.031-.001$). It is the shallow rectangular orbits of these crania, set above massive malars, which is one of the more striking features of the Coobool Creek facial skeletons. There is no significant difference in mean orbital breadth between the male samples. A comparison of the male and female dimensions indicate some dimorphism in

orbit size. With the exception of mean orbit height in the Coobool Creek female sample, the male mean values are all greater than the female means. There is a significant difference in mean orbital breadth between the male and female samples in the Murray Valley and Swanport crania ($P=.000$).

The maxillae

A combination of large size, prominent canine eminence, marked subnasal prognathism and extreme alveolar breadth, makes the maxillae from Coobool Creek and Kow Swamp distinct from recent Aboriginal crania.

Following the method of Larnach and Macintosh (1966:31-32), the depth of the infraorbital fossae was measured with coordinate calipers (Table 37). In only one individual (CC71) can the fossae be classified as deep according to Larnach and Macintosh's criteria.

TABLE 37: Depth of the infraorbital fossae in Coobool Creek male crania

Absent	(0-2.9mm).	
Slight	(3-5.9mm).	CC13, CC28, CC29, CC37, CC45, CC46, CC49, CC65
Medium	(6-7.9mm).	CC16, CC45, CC66
Deep	(8-9.9mm).	CC71
Very deep	(>10mm).	

The large size of the canine roots in the Coobool Creek crania produce long and prominent canine eminences, extending to within a few millimeters of the lateral margins of the nasal aperture. A combined eminence is formed by the bulging canine and first premolar roots in CC71, with deep fossae anterior of the canine roots.

Subnasal prognathism was graded using casts of the limits of the medium grade defined by Larnach and Macintosh (1966:32) (Table 38). Great subnasal prognathism clearly distinguishes the Coobool Creek crania from

Larnach and Macintosh's Coastal N.S.W. and Queensland series, in which 27.0 and 25.7 percent respectively were classed as large. Thirty-seven percent of the combined Euston series (35 percent of the males and 39 percent of the females) have large-grade subnasal prognathism.

TABLE 38: Subnasal prognathism

Absent

Small

Medium CC13, CC29, CC65

Large CC1*, CC9*, CC12*, CC16, CC28, CC37, CC40, CC41, CC45, CC46, CC49, CC66, CC71

* female crania

The mean height of the subnasal region (nasospinale-prosthion) in the Coobool Creek male crania is significantly greater than the Swanport and Broadbeach male means ($P=.002-.000$), but does not exceed the Murray Valley mean ($P=.566$). A large and prognathic subnasal area is a regional feature of crania from the central Murray River Valley, differentiating these crania from the Swanport and Broadbeach crania. The significant difference between the male and female means for subnasal height in the Murray Valley sample ($P=.000$) is not shared by either the Swanport ($P=.995$) or Coobool Creek samples ($P=.075$).

There is some variability in the form of the palate in the Coobool Creek series. Great alveolar breadth dominates throughout. In order to facilitate comparisons with the Kow Swamp data (Thorne, 1975), the shape of the Coobool Creek palates have been classified according to the three morphological types defined by Galloway (1937)(Table 39).

TABLE 39: Palate shape

Horseshoe-shaped	CC13, CC16, CC41, CC65, CC66
U-shaped	CC45, CC49
Divergent U-shaped	CC1*, CC9*, CC12*, CC16, CC28, CC29, CC37, CC40, CC46, CC71

* female crania

The dominating shape in the Coobool Creek and Kow Swamp palates is that of a broad, divergent U. With the variation in palate shape, there is associated variation in the position of maximum alveolar breadth (Table 40). With horseshoe-shaped palates the dental arch curves medially, posterior to the first molar, with maximum alveolar breadth usually located adjacent to the disto-buccal root of the first molar. In palates which form a markedly divergent U-shape, the position of maximum alveolar breadth is located posteriorly, in some cases adjacent to the mesio-buccal root of the third molar.

TABLE 40: Location of points of maximum alveolar breadth

Disto-buccal root M1	CC12*, CC37, CC65, CC66
Mesio-buccal root M2	CC13, CC41
Disto-buccal root M2	CC1*, CC16, CC29, CC40, CC45, CC46, CC49
Mesio-buccal root M3	CC9*, CC28, CC71

* female crania

Measurements of alveolar breadth in the Coobool Creek crania indicate that the massive breadth in the palate is evident both posteriorly, at the level of the second molars (alveolar breadth), and anteriorly, at the level of the canines (bi-canine breadth). Both of these dimensions have a significantly greater mean value in the Coobool Creek male and female samples than in the comparative series ($P=.008-.000$), with the maximum alveolar breadth in the Coobool Creek males (83mm for CC71) and females (72mm for CC50).

exceeding the maxima in the comparative series (Murray Valley male 77mm and female 70mm). Thorne (1975) records a maximum alveolar breadth of 74mm (KS1) in the Kow Swamp crania.

Although both the Coobool Creek and Kow Swamp crania are distinguished by their great alveolar breadth, this is not reflected in similarly great alveolar length. The increased area of alveolar bone necessary to support a large dentition is accomplished with a lateral, rather than an antero-posterior, extension of the alveolar process. Alveolar length in the Coobool Creek sample, while towards the upper end of the Australian range and significantly greater than that in the Swanport and Broadbeach samples ($P=.000$), is not significantly greater than the Murray Valley mean ($P=.519$). There is marked sexual dimorphism in Australian Aboriginal palate size (Larnach and Freedman, 1964; Brown, 1981a), with significant differences between the male and female mean palate modules in the Coobool Creek, Murray Valley and Swanport samples ($P=.001-.000$).

The form of the palatal walls in the Coobool Creek crania vary from nearly vertical in those crania with high, arched palates (CC16, CC29, CC41, CC45, CC46 and CC49) to a gradually sloping smooth curve in those crania with shallow palates (CC65 and CC66). Other palates are intermediate. Medially, slight elevations of the palatine processes are evident in 12 of the reconstructed crania. Campbell (1925:44) subdivided these elevations into four forms of palatine tori, and noted that 'it is somewhat doubtful whether in some cases this elevation is worthy of the title torus'. Most frequently the 'torus' in the Coobool Creek crania is represented by a small triangular boss occupying the midline of the horizontal plates of the palate bone (*torus palatinus medianus*). The four median maxillary tori are of only moderate development, with the maximum development in CC46 (Table 41).

TABLE 41: Form of the palatine torus

<i>Torus maxillaris medianus</i>	CC13, CC41, CC46, CC71
<i>Torus palatinus medianus</i>	CC9, CC10, CC16, CC29, CC37, CC40, CC45, CC66
<i>Torus palatinus transversus</i>	
<i>Crista palatinus transversus</i>	

Facial size and prognathism

Both the Coobool Creek and Kow Swamp crania have mean upper facial heights (nasion-prosthion) which are significantly greater ($P=.035-.000$) than the mean values in the comparative series. The maximum upper facial height in the Coobool Creek male crania (78mm for CC16) is equal to the maximum in the Murray Valley sample, and both of these are exceeded by the Kow Swamp maximum of 79mm for KS15 (Thorne, 1975).

Upper facial breadth (bi-ectoconchion) in the Coobool Creek male and female crania is significantly greater than Murray Valley and Swanport means ($P=.010-.000$). There is no significant difference between the Coobool Creek and Broadbeach means for this dimension ($P=.938$).

A striking feature of the Coobool Creek and Kow Swamp crania is their great maximum mid-facial breadth (bi-zygion). It is unfortunate that this variable, which appears to be a major discriminator between Pleistocene and Modern samples, is so poorly preserved in the Broadbeach and Kow Swamp crania. Mean bi-zygion breadth in the Coobool Creek male sample is significantly greater than the Murray Valley and Swanport means ($P=.000$), with the Coobool Creek male maximum (150mm for CC49) exceeding the maximum in the comparative crania (Murray Valley 146mm). This feature is completely preserved in only two of the Kow Swamp crania, with a maximum value of 144mm for KS1. However, Thorne's (1975) estimates for this dimension in the damaged Kow Swamp crania range up to 165mm for KS7.

Damage to the basi-occipital area in the Kow Swamp crania prevents the calculation of the standard gnathic index for these crania. Recently Thorne and Wolpoff (1981:344) have examined prognathism in this material using a midline projection of auriculare as the base point. Data for the three Kow Swamp crania in which this index could be recorded were all above their modern Murray Valley mean, but within the range. Comparisons of the gnathic indices in this analysis indicate that the Murray Valley, Coobool Creek and Swanport crania are more prognathic than the Broadbeach crania ($P=.005$). There are, however, no significant differences between the gnathic indices of the three southern Australian samples ($P=.300-.400$). The Cohuna cranium is prognathic (Gnathic Index 111), but within the modern Australian range.

In a roentographic study of prognathism in the Walbiri of Yuendumu, Barrett, *et al.*, (1963) demonstrated a significant level of sexual dimorphism for this index ($P=.001$). Females were more prognathic than males. As there is no significant difference between the male and female mean gnathic indices in this analysis ($P=.100-.820$), there is a possibility of regional variation in dimorphism for this feature.

Parietal bones

These bones display considerable variation, both in size and morphology, in the Coobool Creek sample. A principal area of variation is the sagittal curvature of the parietals when viewed laterally. This and several other features which may have been influenced by artificial deformation will be examined in Section 4.2.

The Coobool Creek parietals are extremely broad, with a mean maximum breadth in the males and females which is significantly greater than the means for the comparative samples ($P=.007-.000$). The maximum bi-parietal breadth of the Coobool Creek crania (145mm for CC49) exceeds the maximum for the Murray Valley (143mm) and Kow Swamp series, 139mm for KS5 (Thorne, 1975). There is a high degree of dimorphism for this dimension, with a significant difference between the male and female means in each of the cranial samples ($P=.024-.001$).

The points of maximum cranial breadth in the Coobool Creek crania are not always located on the parietals (Table 42). In those crania with prominent parietal bosses (eminences), maximum breadth is usually between the bosses. In five of the crania maximum cranial breadth is located inferiorly, either on the supra-mastoid crests or on the most lateral points of the mastoid processes.

TABLE 42: Location of the points of maximum cranial breadth

Parietal boss	CC1*, CC29, CC41, CC66
Squamous parietal	CC9*, CC28, CC45, CC46, CC71
Squamous temporal	CC13
Supramastoid crest	CC12*, CC49, CC65
Mastoid crest	CC16, CC37

* female crania

Following Larnach (1976), the heights of the parietal bosses measured with coordinate calipers. These were graded according to the categories which he defined (Table 43). High conical bosses are present in several of the Coobool Creek crania, with a maximum height in CC41 (31mm).

A comparison of these data with the Euston male data indicates that the parietal boss attains a significantly greater mean height in the Coobool Creek sample. Thorne (1975) grades all the parietal bosses in the Kow Swamp sample, with the exception of KS8 (medium), as slight. Although the artificially deformed crania CC1, CC29, CC66 and CC41 have 'marked' to 'great' development of the parietal bosses, I am uncertain of the influence that deformation has had on this feature. Prominent bosses are also a feature of cranium CC45 which shows no evidence of deformation. There is a possibility that deformation accentuates the development of the parietal bosses, but these data indicate that there is also a genetic component to the prominent bosses in the Coobool Creek sample. The comparative dimensions of the parietal bosses in the Coobool Creek and Euston samples are as follows:

	n	\bar{X}	s	Range	t	P
Coobool Creek ♂	13	25.6	3.45	17.0-31.0	2.48	0.010
Euston ♂	30	22.9	3.14	17.0-29.0		

TABLE 43: Development of the parietal bosses

Very slight (<22mm)	CC12*, CC28
Slight (22-24mm)	CC9*, CC10, CC37
Medium (25-26mm)	CC13, CC16, CC46, CC49, CC65, CC71
Marked (27-30mm)	CC1*, CC29, CC45, CC66
Great (>30mm)	CC41

* female crania

A low, triangular, mound-like elevation of bone, bordered anteriorly by the coronal suture, is present in the midline of several of the Coobool Creek parietals. This elevation is a posterior continuation of the frontal median ridge and prebregmatic eminence. This feature is particularly prominent in CC37 and CC29. Viewed from above, the eminence, which is centered

on bregma, has the form of an extended diamond. Slight parasagittal depressions border these elevations in CC29, CC41 and CC66.

The inferior and superior temporal lines are visible, although in some instances faintly, in all the reconstructed crania. On the frontal bones these lines curve sharply downwards in the area of the coronal suture, and then curve upwards in the anterior third of the parietals before descending towards the lambdoid suture. Posteriorly the superior temporal lines form a pronounced ridge in several of the crania, immediately anterior to the lambdoid suture (CC16, CC28, CC41, CC45, CC46, CC49, CC65 and CC71). In CC16 the great elevation of the superior temporal lines produces a strong torus which moves down to, and along, the lambdoid suture before continuing down the lateral surface of the mastoid processes. Thorne (1975:119) describes the extremely prominent development of the posterior third of the temporal lines in the Kow Swamp crania.

Temporal bones

The external auditory meatus in the Coobool Creek crania take the form of a deep and broad oval. Small bi-lateral auditory exotoses are present in three of the 16 crania where the auditory meatus is preserved (CC10, CC16 and CC29). Roche (1964) recorded auditory exotoses in 27.8 percent of a Murray Valley sample. Thorne states that 'no Kow Swamp specimen exhibits any evidence of auditory exotoses' (Thorne, 1975:123).

In the majority of the reconstructed crania there is some damage to the superior margin of the squamous portion of the temporal bones. Partial fusion of the temporo-parietal suture is evident in two individuals. There is bi-lateral fusion of the posterior half of the suture in CC13.

In CC10 there is almost complete fusion of the left suture while the right suture remains completely open. A marked lateral bulging of the vault in the area of the suture is found in CC9, CC10, CC46 and CC65.

The zygomatic processes of the temporal bones are robust, with the posterior margin of the zygoma extending posteriorly with the suprameatal crest, which is itself continuous with the supramastoid crest. The supramastoid crest is defined superiorly by a shallow to deep squamous temporal fossa (Larnach and Macintosh, 1970). This fossa, which may extend upward and forward onto the parietals (CC16), generally proceeds anteriorly and inferiorly into the temporal fossa. It is pronounced in CC16, CC49 and CC65.

Medially the glenoid fossae are broad and high, with prominent articular eminences. Although the eminence is slightly flattened in several of the crania (CC16, CC28, CC66, CC71), there is no evidence of vascular proliferation or breakdown of the bony surface in these four crania. The surface of the eminence presents a smooth, completely normal appearance. Thorne (1975:124) describes the Kow Swamp glenoid fossae as large and deep, with no evidence of arthritic flattening.

The depth of this fossa was measured using the procedure developed by Larnach and Macintosh (1966:41). Larnach and Macintosh (1970) report a mean depth of 6.8mm for male crania from Coastal N.S.W. and 5.7mm for Queensland males. The Coobool Creek male mean is 7.1mm, with a maximum depth of 8.5mm for CC71 (Coobool Creek males $n=12$, $\bar{X}=7.1$, $s=0.83$, Range=6.0-8.5). A comparison of the Coobool Creek data with the graded data of Larnach and Macintosh (1966, 1970) indicates the great depth of the fossae in the Coobool Creek series (Table 44).

TABLE 44: Depth of the glenoid fossae in male and female Aboriginal crania

	N.S.W.*	Queensland**	Coobool Creek
Shallow (0-5.0mm)	19.0%	29.4%	-
Medium (5.1-7.0mm)	56.9%	58.8%	50.0%
Deep (>7.0mm)	24.1%	11.8%	50.0%

*Larnach and Macintosh 1966 **Larnach and Macintosh 1970

A regional characteristic of Australian Aboriginal crania from the Murray River Valley is the large size of the mastoid processes (Brown, 1981a). The Coobool Creek mastoids are long and robust, with prominent mastoid crests. Although the mean depth of the mastoids in this sample exceeds that in the comparative series, this is statistically significant only in comparison with the male and female Swanport means ($P=.018-.007$). The maximum depth of the Coobool Creek mastoids (37mm for CC49) exceeds the range of the comparative series (36mm for the Murray Valley and Swanport males). A slight to prominent mastoid crest is present on all of the complete Coobool Creek mastoid processes.

Medial to the mastoid processes, the digastric fossae are varied in length, depth and breadth. Extremely broad and deep fossae are found in CC10, CC16, CC65 and CC71, with shallow and short fossae in CC46 and CC66. The maximum development of the fossae in the Coobool Creek crania exceeds that in the comparative Euston series. There is considerable asymmetry in the development of this area in both the Coobool Creek and Euston samples.

Occipital bone

There is a great deal of variation in the size and morphology of the Coobool Creek occipital bones. Specific aspects of this variation are a function of artificial deformation and will be discussed in section 4.2.

A broad and symmetrical inca bone is present in Coobool cranium 49. This bone has a maximum breadth of 102mm and length of 65mm, with the lateral projections of the bone extending to within 7mm of asterion. Larnach and Macintosh (1966, 1970) found only one inca bone in the 230 crania from Coastal N.S.W. and Queensland which they examined.

Supernumerary bones in the remaining crania are restricted to small to large lambdoid bones (CC9 and CC29 left and right sides, CC37 left side, CC45 and CC66 right side). In cranium CC9 there is a large lambdoid bone on the right side. Probably as a function of the abnormal ossification in this area, there is asymmetrical development of the occipital, with a bulging right side.

The dominating feature of the posterior surface of the occipital is the occipital torus. This torus is of varied development and, with the exception of two male crania (CC37 and CC45), does not attain the prominence evident in some of the Euston male crania. The size of the torus varies from completely absent in the gracile female CC1, to small to medium in 14 individuals and large in CC37 and CC45. In all but two of the male crania (CC29 and CC66) the torus is ridge-shaped. Mound-shaped tori are found in all of the female crania, plus CC29 and CC66. The torus extends to and is bilaterally continuous with the mastoid crest in CC16, CC28, CC37 and CC46. In two individuals (CC41 and CC45) the torus terminates in the occipito-mastoid ridge and in the remaining crania reaches the occipito-mastoid suture. In five of the Kow Swamp crania (KS5, KS7, KS8, KS9 and KS14) the torus is continuous with the mastoid crest (Thorne, 1975:120-121).

Superior to the torus is a slight furrow, the supratotal sulcus, which separates the occipital torus from the occipital plane (Larnach and Macintosh, 1966). This feature is absent in four of the Coobool Creek crania (CC1, CC9, CC12 and CC49), of which CC49 is male. Slight to moderate furrows are evident in 11 of the crania, with two individuals having deep, marked furrows (CC37 and CC45).

Viewed laterally, there is a slight to prominent elevation of the triangular apex of the occipital bone relative to the posterior surface of the parietals. A slight elevation is present in CC9, CC13, CC28, CC29 and CC45, with a greater elevation in CC41 and CC66. In the last two crania the elevation forms a pronounced eminence between the lambdoid suture and occipital torus.

Inferiorly the fossae associated with the origins of the major nuchal muscles display some sex-based variation, with shallow to indistinct fossae in the female crania. However, shallow fossae also feature in several of the male crania (CC10, CC13, CC29 and CC66). Comparisons with the Euston male sample indicate that the average size and depth of the nuchal fossae is less in the Coobool Creek males. Deep, sharply delineated fossae are present in only four of the Coobool Creek crania (CC16, CC28, CC37 and CC45).

The foramen magnum is of varied morphology, though it commonly has the form of a broad elongated oval, often tapering at the posterior end. Comparative dimensions of this foramen were recorded for the Coobool Creek and Murray Valley samples. The Coobool Creek foramina have a greater mean length than those in the Murray Valley samples, with a significant difference between the female mean values ($P=.003$). The difference between the male means is not significant ($P=.060$). There is considerable dimorphism in the

Murray Valley sample for this dimension ($P=.000$), which is not repeated in the Coobool Creek sample. The occipital condyles are long, broad and high, with some asymmetrical variation. Bi-lateral double-faceted condyles are found in CC10, while all the remaining condyles are single.

There are no significant differences between the mean bi-asterionic breadths of the Coobool Creek and comparative samples ($P=.562-.150$), with equal maximum breadths in the Coobool Creek (120mm for CC37) and Murray Valley male samples. The differences between the male and female means in the Swanport and Murray Valley samples are significant ($P=.000$).

Cranial vault thickness

Thorne and Macumber (1972) describe the major vault bones in the Kow Swamp sample as being 'uniformly thick'. They report thicknesses at bregma (8-11.5mm), midfrontal squama (8.5-13.5mm), lambda (8-11.5mm), mid-parietal (8-10mm) and the parietal at asterion (8.5-11.5mm). A comparison of these data with the vault thickness of Australian Aborigines from Yuendumu and a large series of museum crania indicated that 'only at lambda did thickness in the contemporary series approach these values' (Brown, *et al.*, 1979:69).

To determine vault thickness in the Coobool Creek crania, standardised lateral radiographs were taken of each of the reconstructed crania. These crania are heavily mineralised, with deposition of carbonate within the diploe, air cells and sinuses throughout the crania. This resulted in large areas of the vault being radio-opaque. A large series of radiographs was taken to determine which exposure resulted in the best resolution. The optimum exposure was 14 minutes at 55 Kv and 8 mA (Picker-Andrex model 3002FT). The focus to mid-sagittal plane distance was fixed at 142.5cm and

the mid-sagittal to film distance was 115mm. This resulted in a radiographic enlargement of 4.5 percent and all measurements were corrected for this enlargement.

Following Brown, *et al.*, (1979), the thickness of the vault was measured to the nearest 0.1mm at bregma, vertex and lambda. Carbonate encrustation of the frontal sinuses and adjacent endocranial areas resulted in low resolution for this area and no attempt was made to measure thicknesses at nasion and glabella. Two additional measurements were possible, the maximum thickness of the pre-bregmatic eminence and the minimum thickness of the mid-frontal squama.

A comparison of these data with those of Brown, *et al.*, (1979) demonstrates the great mean vault thickness in the Coobool Creek series. The mean values at bregma, vertex and lambda are significantly greater ($P=.05-.001$) than the means for the Yuendumu and Museum crania (Table 45). It is unfortunate that the possible allometric association between cranial size and vault thickness has not been examined in Australian crania. Although the Coobool Creek sample is small, there is a tendency for the larger crania to be thicker. However, due to the small size of the sample, I have not attempted to quantify this correlation.

The most unusual aspect of vault thickness in the Coobool Creek sample is found in the frontal bones of those individuals which show evidence of artificial deformation (Brown, 1981b). There is a pronounced pre-bregmatic expansion of the diploe in these crania, to form a prominent eminence on the midline of the external surface. In some crania there is a corresponding constriction of the mid-frontal squama in front of the eminence. In crania CC65 the minimum thickness of the mid-frontal squama is 5.0mm, with a thickness of 12.1mm at the pre-bregmatic eminence. The maximum thickness of the eminence in the Coobool Creek crania is 13.3mm for CC29.

TABLE 45: Vault thickness in male Aboriginal crania from Coobool Creek (CC), Yuendumu (YU) and the South Australian Museum (SA)

		n	\bar{X}	s	Range
Mid-frontal squama	CC	9	7.5	1.52	5.0- 9.3
Pre-bregmatic eminence	CC	9	10.9	2.16	7.3-13.3
Bregma	CC	9	9.6	1.26	7.3-10.7
	YU*	28	7.3 ²	0.8	6.4- 9.3
	SA*	99	8.0 ²	1.2	4.4-10.6
Vertex	CC	9	8.5	1.15	5.8- 9.6
	YU*	28	7.2 ²	0.8	5.4- 9.0
	SA*	100	7.7 ¹	1.3	4.9-11.5
Lambda	CC	9	10.0	1.48	7.4-12.4
	YU*	28	9.0 ¹	1.4	6.3-12.5
	SA*	101	8.9 ¹	1.4	5.5-12.8

* data from Brown (*et al.*, 1979)

¹ mean values differ significantly from Coobool Creek .05-.01

² mean values differ significantly from Coobool Creek .005-.001

Summary

Morphological and metrical comparisons of the Coobool Creek and Kow Swamp crania clearly distinguish them from recent Australian series. The major distinguishing feature is size. In particular, the male crania combine massive, robust facial skeletons with broad, high and long vaults. Of the 64 variables in the Murray Valley male and Coobool Creek male comparison, 50 have mean values which are significantly greater ($P=.05-.000$) in the Coobool Creek sample. Similar results are obtained in comparisons with the Swanport and Broadbeach male data. Fifty-two variables were available for comparison with the Swanport sample. The mean values for 43 of these were significantly greater in the Coobool Creek sample. Only 24 variables could be compared in the Broadbeach and Coobool Creek samples and 14 of these have significantly greater means in the Coobool Creek series.

Viewed from above, the Coobool Creek crania are markedly dolichocephalic, with broadly flaring zygomatic arches surrounding large temporal fossae. However, it is from a lateral aspect that several of the Coobool Creek and Kow Swamp crania appear distinct, these crania combine marked recession of the frontal squama with great cranial height and flattened occipital bones. I have argued that this morphological pattern is a function of artificial deformation (Brown, 1981b) and the features associated with this will be examined in the next section.

Although there is great morphological variability in the Coobool Creek series, several features which distinguish these crania from the comparative samples are consistent throughout.

- the frontal bones are large, with great supraorbital and postorbital breadth. Supraorbitally, the glabella region is low and broad, with little depression at nasion. The zygomatic trigones are prominent.

- broad and flattened nasal bones, with great breadth at the fronto-nasal articulation.

- absolutely large zygomatic bones, with prominent malar tuberosities and robust, thickened frontal processes.

- shallow, rectangular orbits.

- large maxillae exhibiting great subnasal prognathism and extreme alveolar breadth.

- large and thickened parietal bones, with prominent bosses and great bi-parietal breadth.

- deep glenoid fossae, with prominent articular eminences.

- great vault thickness at bregma, vertex and lambda.

Table 46
Descriptive statistics for the Coobool Creek male and female crania (mm.)

		n	\bar{X}	s	SE	CV	Min.	Max.	W	P	F	P	T	P
Max. Bi-Parietal breadth	CC ♂	17	138.1	3.98	0.966	2.82	133.0	145.0	0.922	0.10				
	CC ♀	7	132.8	6.61	2.502	4.98	119.0	138.0	0.757	0.01	2.76	0.098	2.42	0.024
Glabella-Opisthocranion	CC ♂	17	196.2	5.78	1.403	2.95	185.0	207.0	0.987	0.99				
	CC ♀	7	186.8	6.14	2.324	3.29	179.0	195.0	0.918	0.10	1.13	0.778	3.55	0.002
Glabella-Lambda	CC ♂	17	192.8	6.95	1.687	3.61	181.0	207.0	0.968	0.50				
	CC ♀	7	182.4	5.12	1.938	2.81	175.0	188.0	0.891	0.10	1.84	0.464	3.56	0.002
Basion-Bregma	CC ♂	17	142.4	5.16	1.252	3.62	134.0	153.0	0.963	0.50				
	CC ♀	6	138.0	6.63	2.708	4.81	128.0	147.0	0.986	0.98	1.65	0.407	1.70	0.104
Basion-Nasion	CC ♂	17	104.7	3.49	0.847	3.33	100.0	111.0	0.940	0.10				
	CC ♀	6	100.0	6.54	2.671	6.54	89.0	108.0	0.940	0.50	3.51	0.050	1.70*	0.140
Basion-Nasospinale	CC ♂	14	102.3	3.50	0.935	3.42	97.0	109.0	0.921	0.10				
	CC ♀	5	96.8	2.28	1.020	2.36	93.0	99.0	0.860	0.10	2.36	0.423	3.28	0.004
Basion-Prosthion	CC ♂	13	109.8	4.07	1.131	3.71	105.0	120.0	0.904	0.02				
	CC ♀	5	104.0	2.55	1.140	2.45	100.0	107.0	0.921	0.10	2.56	0.377	2.96	0.009
Basion-Lambda	CC ♂	17	123.9	6.59	1.598	5.32	115.0	142.0	0.900	0.05				
	CC ♀	6	120.1	5.38	2.197	4.48	111.0	127.0	0.941	0.50	1.50	0.692	1.26	0.223
Basion-Inion	CC ♂	17	78.4	4.69	1.138	5.98	71.0	92.0	0.822	<0.01				
	CC ♀	6	77.5	2.34	0.957	3.03	75.0	81.0	0.934	0.50	4.00	0.132	0.48	0.636
Bi-Auriculare	CC ♂	16	126.4	3.09	0.774	2.45	120.0	132.0	0.506	<0.01				
	CC ♀	7	123.4	3.64	1.378	2.95	118.0	128.0	0.905	0.10	1.38	0.567	2.03	0.055
Bi-Asterion	CC ♂	17	110.8	4.12	1.001	3.72	103.0	120.0	0.804	<0.01				
	CC ♀	7	108.0	6.53	2.469	6.05	96.0	113.0	0.804	0.05	2.51	0.133	1.28	0.213
Bi-Sphenion	CC ♂	15	108.2	5.32	1.374	4.91	100.0	118.0	0.812	<0.01				
	CC ♀	6	100.6	3.77	1.542	3.75	98.0	108.0	0.759	0.02	1.98	0.463	3.14	0.005
Glabella-Bregma	CC ♂	17	117.7	5.20	1.262	4.42	110.0	128.0	0.838	<0.01				
	CC ♀	7	109.5	4.27	1.616	3.90	102.0	114.0	0.915	0.10	1.48	0.656	3.65	0.001
Nasion-Bregma	CC ♂	17	120.9	5.25	1.273	4.34	114.0	131.0	0.856	0.01				
	CC ♀	7	114.1	4.25	1.610	3.73	108.0	120.0	0.901	0.10	1.52	0.632	3.03	0.006
Metopion-height	CC ♂	17	23.0	3.64	0.885	15.82	16.0	29.0	0.960	0.50				
	CC ♀	7	23.5	4.03	1.525	17.12	19.0	29.0	0.896	0.10	1.22	0.690	0.30	0.764
Nasion-Metopion	CC ♂	17	53.8	5.31	1.289	9.86	43.0	61.0	0.683	<0.01				
	CC ♀	7	50.2	5.18	1.960	10.31	41.0	57.0	0.949	0.50	1.05	1.000	1.52	0.144
Max. Supraorbital br.	CC ♂	16	115.9	4.13	1.035	3.57	109.0	123.0	0.954	0.50				
	CC ♀	5	110.4	2.07	0.927	1.88	108.0	113.0	0.952	0.50	3.98	0.191	2.85	0.010

*T calculated using separate variance estimate

		n	\bar{X}	s	SE	CV	Min.	Max.	W	P	F	P	T	P
Min. Postorbital breadth	CC ♂	17	99.1	6.12	1.485	6.18	87.0	109.0	0.953	0.10				
	CC ♀	6	95.8	5.19	2.120	5.42	89.0	103.0	0.983	0.95	1.39	0.763	1.17	0.255
Min. Bi-Temporal lines	CC ♂	17	94.7	8.12	1.969	8.57	76.0	109.0	0.972	0.50				
	CC ♀	6	93.3	8.16	3.333	8.75	81.0	103.0	0.956	0.50	1.01	0.886	0.37	0.715
Bi-Zygion	CC ♂	6	144.5	3.93	1.607	2.73	140.0	150.0	0.948	0.50				
	CC ♀	2	135.5	2.12	1.500	1.57	134.0	137.0	-	-	3.44	0.774	2.98	0.025
Bi-Zygomaxillary	CC ♂	12	102.0	4.84	1.398	4.75	94.0	109.0	0.961	0.50				
	CC ♀	6	98.3	4.13	1.687	4.20	92.0	105.0	0.875	0.10	1.37	0.766	1.58	0.133
Bi-Stephanion	CC ♂	17	105.1	8.04	1.950	7.65	87.0	119.0	0.976	0.50				
	CC ♀	6	101.1	5.60	2.286	5.54	95.0	109.0	0.902	0.10	2.06	0.435	1.12	0.275
Bi-Stenionic	CC ♂	17	72.4	3.22	0.782	4.45	67.0	79.0	0.970	0.50				
	CC ♀	6	68.8	1.94	0.792	2.82	67.0	72.0	0.912	0.10	2.76	0.267	2.58	0.017
Opisthion-Inion	CC ♂	17	44.4	4.06	0.985	9.15	39.0	55.0	0.920	0.10				
	CC ♀	6	42.8	5.23	2.136	12.21	35.0	49.0	0.968	0.50	1.66	0.404	0.76	0.455
Opisthion-Lambda	CC ♂	17	102.1	6.04	1.465	5.92	95.0	120.0	0.857	0.01				
	CC ♀	6	100.6	2.50	1.022	2.49	97.0	104.0	0.972	0.50	5.82	0.061	0.56	0.578
Opisthion-Asterion	CC ♂	17	66.2	2.53	0.616	3.83	62.0	71.0	0.968	0.50				
	CC ♀	6	66.5	2.51	1.025	3.77	63.0	69.0	0.873	0.10	1.02	1.000	0.22	0.828
Opisthion-Glabella	CC ♂	17	147.5	3.87	0.940	2.63	141.0	156.0	0.972	0.50				
	CC ♀	6	142.5	7.96	3.253	5.60	130.0	151.0	0.936	0.50	4.23	0.024	2.06	0.053
Foramen Magnum length	CC ♂	17	37.1	2.08	0.506	5.63	35.0	42.0	0.873	0.02				
	CC ♀	6	37.3	2.33	0.955	6.26	34.0	40.0	0.901	0.10	1.25	0.662	0.21	0.835
Foramen Magnum breadth	CC ♂	16	31.0	2.47	0.619	7.99	27.0	36.0	0.527	<0.01				
	CC ♀	6	30.1	1.47	0.601	4.88	28.0	32.0	0.958	0.50	2.83	0.256	0.77	0.452
Basion-Sphenobasion	CC ♂	17	23.1	1.97	0.479	8.53	20.0	26.0	0.902	0.05				
	CC ♀	6	20.8	2.04	0.833	9.80	18.0	24.0	0.975	0.90	1.07	0.829	2.48	0.022
Basion-Asterion	CC ♂	17	80.7	5.40	1.310	6.69	65.0	87.0	0.868	0.01				
	CC ♀	6	77.8	6.96	2.845	8.95	65.0	84.0	0.839	0.10	1.66	0.401	1.06	0.300
Basion-Mastoidale	CC ♂	17	54.5	1.66	0.403	3.05	51.0	57.0	0.916	0.10				
	CC ♀	6	54.0	3.09	1.265	5.74	49.0	58.0	0.965	0.50	3.47	0.052	0.53	0.600
Basion-Staphylion	CC ♂	10	49.7	3.40	1.075	6.84	46.0	57.0	0.915	0.10				
	CC ♀	4	46.7	2.50	1.250	5.35	44.0	50.0	0.982	0.50	1.85	0.667	1.56	0.145
Lambda-Bregma	CC ♂	17	121.1	5.96	1.447	4.93	107.0	129.0	0.895	0.05				
	CC ♀	7	117.0	4.54	1.718	3.88	110.0	121.0	0.826	0.05	1.72	0.518	1.63	0.117
Lambda-Inion	CC ♂	17	68.9	7.86	1.907	11.40	60.0	91.0	0.853	0.01				
	CC ♀	7	66.2	8.32	3.145	12.55	55.0	81.0	0.955	0.50	1.12	0.788	0.74	0.467

		n	\bar{X}	s	SE	CV	Min.	Max.	W	P	F	P	T	P																																																																																																																																																																																																																																																																																																																																																																																																																																				
Lambda-Asterion	CC ♂	17	87.7	5.30	1.286	6.04	79.0	100.0	0.949	0.10	2.49	0.266	1.90	0.071																																																																																																																																																																																																																																																																																																																																																																																																																																				
	CC ♀	7	83.5	3.35	1.270	4.02	80.0	90.0	0.850	0.10					Auriculare-Bregma	CC ♂	17	132.3	3.85	0.935	2.91	129.0	143.0	0.778	<0.01	1.62	0.409	3.32	0.003	CC ♀	7	126.1	4.91	1.875	3.90	119.0	133.0	0.973	0.90	Auriculare-Glabella	CC ♂	17	121.0	4.06	0.985	3.36	115.0	127.0	0.924	0.10	2.58	0.121	2.09	0.048	CC ♀	7	116.4	6.52	2.460	5.61	110.0	124.0	0.805	0.05	Auriculare-Nasion	CC ♂	17	114.6	3.75	0.911	3.28	109.0	121.0	0.928	0.10	2.17	0.202	2.18	0.040	CC ♀	7	110.4	5.53	2.091	5.01	103.0	117.0	0.903	0.10	Auriculare-Nasospinale	CC ♂	14	122.7	2.63	0.705	2.15	118.0	126.0	0.906	0.10	2.80	0.125	2.19	0.042	CC ♀	6	119.3	4.41	1.801	3.70	115.0	127.0	0.871	0.10	Auriculare-Prosthion	CC ♂	13	132.6	2.84	0.789	2.14	128.0	138.0	0.965	0.50	3.49	0.070	2.14	0.047	CC ♀	6	128.6	5.31	2.171	4.13	125.0	139.0	0.751	0.02	Auriculare-Zygomaxillary	CC ♂	15	76.9	3.84	0.993	4.99	72.0	85.0	0.924	0.10	1.72	0.391	0.54	0.593	CC ♀	6	75.8	5.03	2.056	6.64	70.0	83.0	0.946	0.50	Auriculare-Lambda	CC ♂	17	126.1	6.11	1.483	4.85	118.0	144.0	0.892	0.05	2.96	0.186	2.31	0.031	CC ♀	7	120.4	3.55	1.343	2.95	117.0	128.0	0.854	0.10	Auriculare-Inion	CC ♂	17	100.1	4.04	0.981	4.04	94.0	109.0	0.967	0.50	1.97	0.411	2.18	0.040	CC ♀	7	96.4	2.87	1.088	2.98	93.0	101.0	0.919	0.10	Auriculare-Opisthion	CC ♂	17	79.0	2.51	0.609	3.18	74.0	84.0	0.962	0.50	1.48	0.705	0.34	0.736	CC ♀	6	78.6	2.06	0.843	2.63	76.0	81.0	0.918	0.10	Auriculare-Basion	CC ♂	17	68.5	2.06	0.501	3.01	63.0	72.0	0.902	0.05	1.13	0.971	0.38	0.711	CC ♀	6	68.1	1.94	0.792	2.85	65.0	70.0	0.912	0.10	Auriculare-Asterion	CC ♂	17	55.0	5.24	1.272	9.53	45.0	63.0	0.961	0.50	3.93	0.100	2.85	0.090	CC ♀	7	49.0	2.64	1.000	5.40	46.0	52.0	0.851	0.10	Nasion-Nasospinale	CC ♂	14	54.2	3.19	0.854	5.89	50.0	59.0	0.894	0.05	1.17	0.746	2.06	0.054	CC ♀	6	51.0	3.46	1.414	6.79	45.0	54.0	0.857	0.10	Nasion-Prosthion	CC ♂	13	75.0	2.79	0.776	3.73	70.0	78.0	0.875	0.05	2.98	0.112	3.36	0.004	CC ♀	6	69.1	4.83	1.973	6.99	61.0	76.0	0.892	0.10	Nasospinale-Prosthion	CC ♂	14	20.3	2.79	0.746	13.70	17.0	26.0	0.917	0.10	2.24	0.330	1.89	0.075	CC ♀	7	18.1	1.86	0.705	10.27	16.0	21.0	0.889	0.10	Nasal breadth	CC ♂	15	29.5	1.35	0.350	4.59	27.0	32.0	0.955	0.50	3.26	0.064	1.91	0.071	CC ♀	7	28.0	2.44	0.926	8.75	25.0	32.0	0.907	0.10	Orbital height	CC ♂	15	31.2	2.68	0.693	8.59	25.0	35.0	0.954	0.50	2.67	0.354	1.19	0.249	CC ♀	5	32.8	1.64	0.735	5.01	30.0	34.0	0.779	0.05	Orbital breadth	CC ♂	14	43.8	2.03	0.543	4.64	42.0	48.0	0.801	<0.01	5.16	0.125	0.48	0.638	CC ♀	5	43.4	0.89	0.400
Auriculare-Bregma	CC ♂	17	132.3	3.85	0.935	2.91	129.0	143.0	0.778	<0.01	1.62	0.409	3.32	0.003																																																																																																																																																																																																																																																																																																																																																																																																																																				
	CC ♀	7	126.1	4.91	1.875	3.90	119.0	133.0	0.973	0.90					Auriculare-Glabella	CC ♂	17	121.0	4.06	0.985	3.36	115.0	127.0	0.924	0.10	2.58	0.121	2.09	0.048	CC ♀	7	116.4	6.52	2.460	5.61	110.0	124.0	0.805	0.05	Auriculare-Nasion	CC ♂	17	114.6	3.75	0.911	3.28	109.0	121.0	0.928	0.10	2.17	0.202	2.18	0.040	CC ♀	7	110.4	5.53	2.091	5.01	103.0	117.0	0.903	0.10	Auriculare-Nasospinale	CC ♂	14	122.7	2.63	0.705	2.15	118.0	126.0	0.906	0.10	2.80	0.125	2.19	0.042	CC ♀	6	119.3	4.41	1.801	3.70	115.0	127.0	0.871	0.10	Auriculare-Prosthion	CC ♂	13	132.6	2.84	0.789	2.14	128.0	138.0	0.965	0.50	3.49	0.070	2.14	0.047	CC ♀	6	128.6	5.31	2.171	4.13	125.0	139.0	0.751	0.02	Auriculare-Zygomaxillary	CC ♂	15	76.9	3.84	0.993	4.99	72.0	85.0	0.924	0.10	1.72	0.391	0.54	0.593	CC ♀	6	75.8	5.03	2.056	6.64	70.0	83.0	0.946	0.50	Auriculare-Lambda	CC ♂	17	126.1	6.11	1.483	4.85	118.0	144.0	0.892	0.05	2.96	0.186	2.31	0.031	CC ♀	7	120.4	3.55	1.343	2.95	117.0	128.0	0.854	0.10	Auriculare-Inion	CC ♂	17	100.1	4.04	0.981	4.04	94.0	109.0	0.967	0.50	1.97	0.411	2.18	0.040	CC ♀	7	96.4	2.87	1.088	2.98	93.0	101.0	0.919	0.10	Auriculare-Opisthion	CC ♂	17	79.0	2.51	0.609	3.18	74.0	84.0	0.962	0.50	1.48	0.705	0.34	0.736	CC ♀	6	78.6	2.06	0.843	2.63	76.0	81.0	0.918	0.10	Auriculare-Basion	CC ♂	17	68.5	2.06	0.501	3.01	63.0	72.0	0.902	0.05	1.13	0.971	0.38	0.711	CC ♀	6	68.1	1.94	0.792	2.85	65.0	70.0	0.912	0.10	Auriculare-Asterion	CC ♂	17	55.0	5.24	1.272	9.53	45.0	63.0	0.961	0.50	3.93	0.100	2.85	0.090	CC ♀	7	49.0	2.64	1.000	5.40	46.0	52.0	0.851	0.10	Nasion-Nasospinale	CC ♂	14	54.2	3.19	0.854	5.89	50.0	59.0	0.894	0.05	1.17	0.746	2.06	0.054	CC ♀	6	51.0	3.46	1.414	6.79	45.0	54.0	0.857	0.10	Nasion-Prosthion	CC ♂	13	75.0	2.79	0.776	3.73	70.0	78.0	0.875	0.05	2.98	0.112	3.36	0.004	CC ♀	6	69.1	4.83	1.973	6.99	61.0	76.0	0.892	0.10	Nasospinale-Prosthion	CC ♂	14	20.3	2.79	0.746	13.70	17.0	26.0	0.917	0.10	2.24	0.330	1.89	0.075	CC ♀	7	18.1	1.86	0.705	10.27	16.0	21.0	0.889	0.10	Nasal breadth	CC ♂	15	29.5	1.35	0.350	4.59	27.0	32.0	0.955	0.50	3.26	0.064	1.91	0.071	CC ♀	7	28.0	2.44	0.926	8.75	25.0	32.0	0.907	0.10	Orbital height	CC ♂	15	31.2	2.68	0.693	8.59	25.0	35.0	0.954	0.50	2.67	0.354	1.19	0.249	CC ♀	5	32.8	1.64	0.735	5.01	30.0	34.0	0.779	0.05	Orbital breadth	CC ♂	14	43.8	2.03	0.543	4.64	42.0	48.0	0.801	<0.01	5.16	0.125	0.48	0.638	CC ♀	5	43.4	0.89	0.400	2.06	42.0	44.0	0.771	0.05																				
Auriculare-Glabella	CC ♂	17	121.0	4.06	0.985	3.36	115.0	127.0	0.924	0.10	2.58	0.121	2.09	0.048																																																																																																																																																																																																																																																																																																																																																																																																																																				
	CC ♀	7	116.4	6.52	2.460	5.61	110.0	124.0	0.805	0.05					Auriculare-Nasion	CC ♂	17	114.6	3.75	0.911	3.28	109.0	121.0	0.928	0.10	2.17	0.202	2.18	0.040	CC ♀	7	110.4	5.53	2.091	5.01	103.0	117.0	0.903	0.10	Auriculare-Nasospinale	CC ♂	14	122.7	2.63	0.705	2.15	118.0	126.0	0.906	0.10	2.80	0.125	2.19	0.042	CC ♀	6	119.3	4.41	1.801	3.70	115.0	127.0	0.871	0.10	Auriculare-Prosthion	CC ♂	13	132.6	2.84	0.789	2.14	128.0	138.0	0.965	0.50	3.49	0.070	2.14	0.047	CC ♀	6	128.6	5.31	2.171	4.13	125.0	139.0	0.751	0.02	Auriculare-Zygomaxillary	CC ♂	15	76.9	3.84	0.993	4.99	72.0	85.0	0.924	0.10	1.72	0.391	0.54	0.593	CC ♀	6	75.8	5.03	2.056	6.64	70.0	83.0	0.946	0.50	Auriculare-Lambda	CC ♂	17	126.1	6.11	1.483	4.85	118.0	144.0	0.892	0.05	2.96	0.186	2.31	0.031	CC ♀	7	120.4	3.55	1.343	2.95	117.0	128.0	0.854	0.10	Auriculare-Inion	CC ♂	17	100.1	4.04	0.981	4.04	94.0	109.0	0.967	0.50	1.97	0.411	2.18	0.040	CC ♀	7	96.4	2.87	1.088	2.98	93.0	101.0	0.919	0.10	Auriculare-Opisthion	CC ♂	17	79.0	2.51	0.609	3.18	74.0	84.0	0.962	0.50	1.48	0.705	0.34	0.736	CC ♀	6	78.6	2.06	0.843	2.63	76.0	81.0	0.918	0.10	Auriculare-Basion	CC ♂	17	68.5	2.06	0.501	3.01	63.0	72.0	0.902	0.05	1.13	0.971	0.38	0.711	CC ♀	6	68.1	1.94	0.792	2.85	65.0	70.0	0.912	0.10	Auriculare-Asterion	CC ♂	17	55.0	5.24	1.272	9.53	45.0	63.0	0.961	0.50	3.93	0.100	2.85	0.090	CC ♀	7	49.0	2.64	1.000	5.40	46.0	52.0	0.851	0.10	Nasion-Nasospinale	CC ♂	14	54.2	3.19	0.854	5.89	50.0	59.0	0.894	0.05	1.17	0.746	2.06	0.054	CC ♀	6	51.0	3.46	1.414	6.79	45.0	54.0	0.857	0.10	Nasion-Prosthion	CC ♂	13	75.0	2.79	0.776	3.73	70.0	78.0	0.875	0.05	2.98	0.112	3.36	0.004	CC ♀	6	69.1	4.83	1.973	6.99	61.0	76.0	0.892	0.10	Nasospinale-Prosthion	CC ♂	14	20.3	2.79	0.746	13.70	17.0	26.0	0.917	0.10	2.24	0.330	1.89	0.075	CC ♀	7	18.1	1.86	0.705	10.27	16.0	21.0	0.889	0.10	Nasal breadth	CC ♂	15	29.5	1.35	0.350	4.59	27.0	32.0	0.955	0.50	3.26	0.064	1.91	0.071	CC ♀	7	28.0	2.44	0.926	8.75	25.0	32.0	0.907	0.10	Orbital height	CC ♂	15	31.2	2.68	0.693	8.59	25.0	35.0	0.954	0.50	2.67	0.354	1.19	0.249	CC ♀	5	32.8	1.64	0.735	5.01	30.0	34.0	0.779	0.05	Orbital breadth	CC ♂	14	43.8	2.03	0.543	4.64	42.0	48.0	0.801	<0.01	5.16	0.125	0.48	0.638	CC ♀	5	43.4	0.89	0.400	2.06	42.0	44.0	0.771	0.05																																													
Auriculare-Nasion	CC ♂	17	114.6	3.75	0.911	3.28	109.0	121.0	0.928	0.10	2.17	0.202	2.18	0.040																																																																																																																																																																																																																																																																																																																																																																																																																																				
	CC ♀	7	110.4	5.53	2.091	5.01	103.0	117.0	0.903	0.10					Auriculare-Nasospinale	CC ♂	14	122.7	2.63	0.705	2.15	118.0	126.0	0.906	0.10	2.80	0.125	2.19	0.042	CC ♀	6	119.3	4.41	1.801	3.70	115.0	127.0	0.871	0.10	Auriculare-Prosthion	CC ♂	13	132.6	2.84	0.789	2.14	128.0	138.0	0.965	0.50	3.49	0.070	2.14	0.047	CC ♀	6	128.6	5.31	2.171	4.13	125.0	139.0	0.751	0.02	Auriculare-Zygomaxillary	CC ♂	15	76.9	3.84	0.993	4.99	72.0	85.0	0.924	0.10	1.72	0.391	0.54	0.593	CC ♀	6	75.8	5.03	2.056	6.64	70.0	83.0	0.946	0.50	Auriculare-Lambda	CC ♂	17	126.1	6.11	1.483	4.85	118.0	144.0	0.892	0.05	2.96	0.186	2.31	0.031	CC ♀	7	120.4	3.55	1.343	2.95	117.0	128.0	0.854	0.10	Auriculare-Inion	CC ♂	17	100.1	4.04	0.981	4.04	94.0	109.0	0.967	0.50	1.97	0.411	2.18	0.040	CC ♀	7	96.4	2.87	1.088	2.98	93.0	101.0	0.919	0.10	Auriculare-Opisthion	CC ♂	17	79.0	2.51	0.609	3.18	74.0	84.0	0.962	0.50	1.48	0.705	0.34	0.736	CC ♀	6	78.6	2.06	0.843	2.63	76.0	81.0	0.918	0.10	Auriculare-Basion	CC ♂	17	68.5	2.06	0.501	3.01	63.0	72.0	0.902	0.05	1.13	0.971	0.38	0.711	CC ♀	6	68.1	1.94	0.792	2.85	65.0	70.0	0.912	0.10	Auriculare-Asterion	CC ♂	17	55.0	5.24	1.272	9.53	45.0	63.0	0.961	0.50	3.93	0.100	2.85	0.090	CC ♀	7	49.0	2.64	1.000	5.40	46.0	52.0	0.851	0.10	Nasion-Nasospinale	CC ♂	14	54.2	3.19	0.854	5.89	50.0	59.0	0.894	0.05	1.17	0.746	2.06	0.054	CC ♀	6	51.0	3.46	1.414	6.79	45.0	54.0	0.857	0.10	Nasion-Prosthion	CC ♂	13	75.0	2.79	0.776	3.73	70.0	78.0	0.875	0.05	2.98	0.112	3.36	0.004	CC ♀	6	69.1	4.83	1.973	6.99	61.0	76.0	0.892	0.10	Nasospinale-Prosthion	CC ♂	14	20.3	2.79	0.746	13.70	17.0	26.0	0.917	0.10	2.24	0.330	1.89	0.075	CC ♀	7	18.1	1.86	0.705	10.27	16.0	21.0	0.889	0.10	Nasal breadth	CC ♂	15	29.5	1.35	0.350	4.59	27.0	32.0	0.955	0.50	3.26	0.064	1.91	0.071	CC ♀	7	28.0	2.44	0.926	8.75	25.0	32.0	0.907	0.10	Orbital height	CC ♂	15	31.2	2.68	0.693	8.59	25.0	35.0	0.954	0.50	2.67	0.354	1.19	0.249	CC ♀	5	32.8	1.64	0.735	5.01	30.0	34.0	0.779	0.05	Orbital breadth	CC ♂	14	43.8	2.03	0.543	4.64	42.0	48.0	0.801	<0.01	5.16	0.125	0.48	0.638	CC ♀	5	43.4	0.89	0.400	2.06	42.0	44.0	0.771	0.05																																																																						
Auriculare-Nasospinale	CC ♂	14	122.7	2.63	0.705	2.15	118.0	126.0	0.906	0.10	2.80	0.125	2.19	0.042																																																																																																																																																																																																																																																																																																																																																																																																																																				
	CC ♀	6	119.3	4.41	1.801	3.70	115.0	127.0	0.871	0.10					Auriculare-Prosthion	CC ♂	13	132.6	2.84	0.789	2.14	128.0	138.0	0.965	0.50	3.49	0.070	2.14	0.047	CC ♀	6	128.6	5.31	2.171	4.13	125.0	139.0	0.751	0.02	Auriculare-Zygomaxillary	CC ♂	15	76.9	3.84	0.993	4.99	72.0	85.0	0.924	0.10	1.72	0.391	0.54	0.593	CC ♀	6	75.8	5.03	2.056	6.64	70.0	83.0	0.946	0.50	Auriculare-Lambda	CC ♂	17	126.1	6.11	1.483	4.85	118.0	144.0	0.892	0.05	2.96	0.186	2.31	0.031	CC ♀	7	120.4	3.55	1.343	2.95	117.0	128.0	0.854	0.10	Auriculare-Inion	CC ♂	17	100.1	4.04	0.981	4.04	94.0	109.0	0.967	0.50	1.97	0.411	2.18	0.040	CC ♀	7	96.4	2.87	1.088	2.98	93.0	101.0	0.919	0.10	Auriculare-Opisthion	CC ♂	17	79.0	2.51	0.609	3.18	74.0	84.0	0.962	0.50	1.48	0.705	0.34	0.736	CC ♀	6	78.6	2.06	0.843	2.63	76.0	81.0	0.918	0.10	Auriculare-Basion	CC ♂	17	68.5	2.06	0.501	3.01	63.0	72.0	0.902	0.05	1.13	0.971	0.38	0.711	CC ♀	6	68.1	1.94	0.792	2.85	65.0	70.0	0.912	0.10	Auriculare-Asterion	CC ♂	17	55.0	5.24	1.272	9.53	45.0	63.0	0.961	0.50	3.93	0.100	2.85	0.090	CC ♀	7	49.0	2.64	1.000	5.40	46.0	52.0	0.851	0.10	Nasion-Nasospinale	CC ♂	14	54.2	3.19	0.854	5.89	50.0	59.0	0.894	0.05	1.17	0.746	2.06	0.054	CC ♀	6	51.0	3.46	1.414	6.79	45.0	54.0	0.857	0.10	Nasion-Prosthion	CC ♂	13	75.0	2.79	0.776	3.73	70.0	78.0	0.875	0.05	2.98	0.112	3.36	0.004	CC ♀	6	69.1	4.83	1.973	6.99	61.0	76.0	0.892	0.10	Nasospinale-Prosthion	CC ♂	14	20.3	2.79	0.746	13.70	17.0	26.0	0.917	0.10	2.24	0.330	1.89	0.075	CC ♀	7	18.1	1.86	0.705	10.27	16.0	21.0	0.889	0.10	Nasal breadth	CC ♂	15	29.5	1.35	0.350	4.59	27.0	32.0	0.955	0.50	3.26	0.064	1.91	0.071	CC ♀	7	28.0	2.44	0.926	8.75	25.0	32.0	0.907	0.10	Orbital height	CC ♂	15	31.2	2.68	0.693	8.59	25.0	35.0	0.954	0.50	2.67	0.354	1.19	0.249	CC ♀	5	32.8	1.64	0.735	5.01	30.0	34.0	0.779	0.05	Orbital breadth	CC ♂	14	43.8	2.03	0.543	4.64	42.0	48.0	0.801	<0.01	5.16	0.125	0.48	0.638	CC ♀	5	43.4	0.89	0.400	2.06	42.0	44.0	0.771	0.05																																																																																															
Auriculare-Prosthion	CC ♂	13	132.6	2.84	0.789	2.14	128.0	138.0	0.965	0.50	3.49	0.070	2.14	0.047																																																																																																																																																																																																																																																																																																																																																																																																																																				
	CC ♀	6	128.6	5.31	2.171	4.13	125.0	139.0	0.751	0.02					Auriculare-Zygomaxillary	CC ♂	15	76.9	3.84	0.993	4.99	72.0	85.0	0.924	0.10	1.72	0.391	0.54	0.593	CC ♀	6	75.8	5.03	2.056	6.64	70.0	83.0	0.946	0.50	Auriculare-Lambda	CC ♂	17	126.1	6.11	1.483	4.85	118.0	144.0	0.892	0.05	2.96	0.186	2.31	0.031	CC ♀	7	120.4	3.55	1.343	2.95	117.0	128.0	0.854	0.10	Auriculare-Inion	CC ♂	17	100.1	4.04	0.981	4.04	94.0	109.0	0.967	0.50	1.97	0.411	2.18	0.040	CC ♀	7	96.4	2.87	1.088	2.98	93.0	101.0	0.919	0.10	Auriculare-Opisthion	CC ♂	17	79.0	2.51	0.609	3.18	74.0	84.0	0.962	0.50	1.48	0.705	0.34	0.736	CC ♀	6	78.6	2.06	0.843	2.63	76.0	81.0	0.918	0.10	Auriculare-Basion	CC ♂	17	68.5	2.06	0.501	3.01	63.0	72.0	0.902	0.05	1.13	0.971	0.38	0.711	CC ♀	6	68.1	1.94	0.792	2.85	65.0	70.0	0.912	0.10	Auriculare-Asterion	CC ♂	17	55.0	5.24	1.272	9.53	45.0	63.0	0.961	0.50	3.93	0.100	2.85	0.090	CC ♀	7	49.0	2.64	1.000	5.40	46.0	52.0	0.851	0.10	Nasion-Nasospinale	CC ♂	14	54.2	3.19	0.854	5.89	50.0	59.0	0.894	0.05	1.17	0.746	2.06	0.054	CC ♀	6	51.0	3.46	1.414	6.79	45.0	54.0	0.857	0.10	Nasion-Prosthion	CC ♂	13	75.0	2.79	0.776	3.73	70.0	78.0	0.875	0.05	2.98	0.112	3.36	0.004	CC ♀	6	69.1	4.83	1.973	6.99	61.0	76.0	0.892	0.10	Nasospinale-Prosthion	CC ♂	14	20.3	2.79	0.746	13.70	17.0	26.0	0.917	0.10	2.24	0.330	1.89	0.075	CC ♀	7	18.1	1.86	0.705	10.27	16.0	21.0	0.889	0.10	Nasal breadth	CC ♂	15	29.5	1.35	0.350	4.59	27.0	32.0	0.955	0.50	3.26	0.064	1.91	0.071	CC ♀	7	28.0	2.44	0.926	8.75	25.0	32.0	0.907	0.10	Orbital height	CC ♂	15	31.2	2.68	0.693	8.59	25.0	35.0	0.954	0.50	2.67	0.354	1.19	0.249	CC ♀	5	32.8	1.64	0.735	5.01	30.0	34.0	0.779	0.05	Orbital breadth	CC ♂	14	43.8	2.03	0.543	4.64	42.0	48.0	0.801	<0.01	5.16	0.125	0.48	0.638	CC ♀	5	43.4	0.89	0.400	2.06	42.0	44.0	0.771	0.05																																																																																																																								
Auriculare-Zygomaxillary	CC ♂	15	76.9	3.84	0.993	4.99	72.0	85.0	0.924	0.10	1.72	0.391	0.54	0.593																																																																																																																																																																																																																																																																																																																																																																																																																																				
	CC ♀	6	75.8	5.03	2.056	6.64	70.0	83.0	0.946	0.50					Auriculare-Lambda	CC ♂	17	126.1	6.11	1.483	4.85	118.0	144.0	0.892	0.05	2.96	0.186	2.31	0.031	CC ♀	7	120.4	3.55	1.343	2.95	117.0	128.0	0.854	0.10	Auriculare-Inion	CC ♂	17	100.1	4.04	0.981	4.04	94.0	109.0	0.967	0.50	1.97	0.411	2.18	0.040	CC ♀	7	96.4	2.87	1.088	2.98	93.0	101.0	0.919	0.10	Auriculare-Opisthion	CC ♂	17	79.0	2.51	0.609	3.18	74.0	84.0	0.962	0.50	1.48	0.705	0.34	0.736	CC ♀	6	78.6	2.06	0.843	2.63	76.0	81.0	0.918	0.10	Auriculare-Basion	CC ♂	17	68.5	2.06	0.501	3.01	63.0	72.0	0.902	0.05	1.13	0.971	0.38	0.711	CC ♀	6	68.1	1.94	0.792	2.85	65.0	70.0	0.912	0.10	Auriculare-Asterion	CC ♂	17	55.0	5.24	1.272	9.53	45.0	63.0	0.961	0.50	3.93	0.100	2.85	0.090	CC ♀	7	49.0	2.64	1.000	5.40	46.0	52.0	0.851	0.10	Nasion-Nasospinale	CC ♂	14	54.2	3.19	0.854	5.89	50.0	59.0	0.894	0.05	1.17	0.746	2.06	0.054	CC ♀	6	51.0	3.46	1.414	6.79	45.0	54.0	0.857	0.10	Nasion-Prosthion	CC ♂	13	75.0	2.79	0.776	3.73	70.0	78.0	0.875	0.05	2.98	0.112	3.36	0.004	CC ♀	6	69.1	4.83	1.973	6.99	61.0	76.0	0.892	0.10	Nasospinale-Prosthion	CC ♂	14	20.3	2.79	0.746	13.70	17.0	26.0	0.917	0.10	2.24	0.330	1.89	0.075	CC ♀	7	18.1	1.86	0.705	10.27	16.0	21.0	0.889	0.10	Nasal breadth	CC ♂	15	29.5	1.35	0.350	4.59	27.0	32.0	0.955	0.50	3.26	0.064	1.91	0.071	CC ♀	7	28.0	2.44	0.926	8.75	25.0	32.0	0.907	0.10	Orbital height	CC ♂	15	31.2	2.68	0.693	8.59	25.0	35.0	0.954	0.50	2.67	0.354	1.19	0.249	CC ♀	5	32.8	1.64	0.735	5.01	30.0	34.0	0.779	0.05	Orbital breadth	CC ♂	14	43.8	2.03	0.543	4.64	42.0	48.0	0.801	<0.01	5.16	0.125	0.48	0.638	CC ♀	5	43.4	0.89	0.400	2.06	42.0	44.0	0.771	0.05																																																																																																																																																	
Auriculare-Lambda	CC ♂	17	126.1	6.11	1.483	4.85	118.0	144.0	0.892	0.05	2.96	0.186	2.31	0.031																																																																																																																																																																																																																																																																																																																																																																																																																																				
	CC ♀	7	120.4	3.55	1.343	2.95	117.0	128.0	0.854	0.10					Auriculare-Inion	CC ♂	17	100.1	4.04	0.981	4.04	94.0	109.0	0.967	0.50	1.97	0.411	2.18	0.040	CC ♀	7	96.4	2.87	1.088	2.98	93.0	101.0	0.919	0.10	Auriculare-Opisthion	CC ♂	17	79.0	2.51	0.609	3.18	74.0	84.0	0.962	0.50	1.48	0.705	0.34	0.736	CC ♀	6	78.6	2.06	0.843	2.63	76.0	81.0	0.918	0.10	Auriculare-Basion	CC ♂	17	68.5	2.06	0.501	3.01	63.0	72.0	0.902	0.05	1.13	0.971	0.38	0.711	CC ♀	6	68.1	1.94	0.792	2.85	65.0	70.0	0.912	0.10	Auriculare-Asterion	CC ♂	17	55.0	5.24	1.272	9.53	45.0	63.0	0.961	0.50	3.93	0.100	2.85	0.090	CC ♀	7	49.0	2.64	1.000	5.40	46.0	52.0	0.851	0.10	Nasion-Nasospinale	CC ♂	14	54.2	3.19	0.854	5.89	50.0	59.0	0.894	0.05	1.17	0.746	2.06	0.054	CC ♀	6	51.0	3.46	1.414	6.79	45.0	54.0	0.857	0.10	Nasion-Prosthion	CC ♂	13	75.0	2.79	0.776	3.73	70.0	78.0	0.875	0.05	2.98	0.112	3.36	0.004	CC ♀	6	69.1	4.83	1.973	6.99	61.0	76.0	0.892	0.10	Nasospinale-Prosthion	CC ♂	14	20.3	2.79	0.746	13.70	17.0	26.0	0.917	0.10	2.24	0.330	1.89	0.075	CC ♀	7	18.1	1.86	0.705	10.27	16.0	21.0	0.889	0.10	Nasal breadth	CC ♂	15	29.5	1.35	0.350	4.59	27.0	32.0	0.955	0.50	3.26	0.064	1.91	0.071	CC ♀	7	28.0	2.44	0.926	8.75	25.0	32.0	0.907	0.10	Orbital height	CC ♂	15	31.2	2.68	0.693	8.59	25.0	35.0	0.954	0.50	2.67	0.354	1.19	0.249	CC ♀	5	32.8	1.64	0.735	5.01	30.0	34.0	0.779	0.05	Orbital breadth	CC ♂	14	43.8	2.03	0.543	4.64	42.0	48.0	0.801	<0.01	5.16	0.125	0.48	0.638	CC ♀	5	43.4	0.89	0.400	2.06	42.0	44.0	0.771	0.05																																																																																																																																																																										
Auriculare-Inion	CC ♂	17	100.1	4.04	0.981	4.04	94.0	109.0	0.967	0.50	1.97	0.411	2.18	0.040																																																																																																																																																																																																																																																																																																																																																																																																																																				
	CC ♀	7	96.4	2.87	1.088	2.98	93.0	101.0	0.919	0.10					Auriculare-Opisthion	CC ♂	17	79.0	2.51	0.609	3.18	74.0	84.0	0.962	0.50	1.48	0.705	0.34	0.736	CC ♀	6	78.6	2.06	0.843	2.63	76.0	81.0	0.918	0.10	Auriculare-Basion	CC ♂	17	68.5	2.06	0.501	3.01	63.0	72.0	0.902	0.05	1.13	0.971	0.38	0.711	CC ♀	6	68.1	1.94	0.792	2.85	65.0	70.0	0.912	0.10	Auriculare-Asterion	CC ♂	17	55.0	5.24	1.272	9.53	45.0	63.0	0.961	0.50	3.93	0.100	2.85	0.090	CC ♀	7	49.0	2.64	1.000	5.40	46.0	52.0	0.851	0.10	Nasion-Nasospinale	CC ♂	14	54.2	3.19	0.854	5.89	50.0	59.0	0.894	0.05	1.17	0.746	2.06	0.054	CC ♀	6	51.0	3.46	1.414	6.79	45.0	54.0	0.857	0.10	Nasion-Prosthion	CC ♂	13	75.0	2.79	0.776	3.73	70.0	78.0	0.875	0.05	2.98	0.112	3.36	0.004	CC ♀	6	69.1	4.83	1.973	6.99	61.0	76.0	0.892	0.10	Nasospinale-Prosthion	CC ♂	14	20.3	2.79	0.746	13.70	17.0	26.0	0.917	0.10	2.24	0.330	1.89	0.075	CC ♀	7	18.1	1.86	0.705	10.27	16.0	21.0	0.889	0.10	Nasal breadth	CC ♂	15	29.5	1.35	0.350	4.59	27.0	32.0	0.955	0.50	3.26	0.064	1.91	0.071	CC ♀	7	28.0	2.44	0.926	8.75	25.0	32.0	0.907	0.10	Orbital height	CC ♂	15	31.2	2.68	0.693	8.59	25.0	35.0	0.954	0.50	2.67	0.354	1.19	0.249	CC ♀	5	32.8	1.64	0.735	5.01	30.0	34.0	0.779	0.05	Orbital breadth	CC ♂	14	43.8	2.03	0.543	4.64	42.0	48.0	0.801	<0.01	5.16	0.125	0.48	0.638	CC ♀	5	43.4	0.89	0.400	2.06	42.0	44.0	0.771	0.05																																																																																																																																																																																																			
Auriculare-Opisthion	CC ♂	17	79.0	2.51	0.609	3.18	74.0	84.0	0.962	0.50	1.48	0.705	0.34	0.736																																																																																																																																																																																																																																																																																																																																																																																																																																				
	CC ♀	6	78.6	2.06	0.843	2.63	76.0	81.0	0.918	0.10					Auriculare-Basion	CC ♂	17	68.5	2.06	0.501	3.01	63.0	72.0	0.902	0.05	1.13	0.971	0.38	0.711	CC ♀	6	68.1	1.94	0.792	2.85	65.0	70.0	0.912	0.10	Auriculare-Asterion	CC ♂	17	55.0	5.24	1.272	9.53	45.0	63.0	0.961	0.50	3.93	0.100	2.85	0.090	CC ♀	7	49.0	2.64	1.000	5.40	46.0	52.0	0.851	0.10	Nasion-Nasospinale	CC ♂	14	54.2	3.19	0.854	5.89	50.0	59.0	0.894	0.05	1.17	0.746	2.06	0.054	CC ♀	6	51.0	3.46	1.414	6.79	45.0	54.0	0.857	0.10	Nasion-Prosthion	CC ♂	13	75.0	2.79	0.776	3.73	70.0	78.0	0.875	0.05	2.98	0.112	3.36	0.004	CC ♀	6	69.1	4.83	1.973	6.99	61.0	76.0	0.892	0.10	Nasospinale-Prosthion	CC ♂	14	20.3	2.79	0.746	13.70	17.0	26.0	0.917	0.10	2.24	0.330	1.89	0.075	CC ♀	7	18.1	1.86	0.705	10.27	16.0	21.0	0.889	0.10	Nasal breadth	CC ♂	15	29.5	1.35	0.350	4.59	27.0	32.0	0.955	0.50	3.26	0.064	1.91	0.071	CC ♀	7	28.0	2.44	0.926	8.75	25.0	32.0	0.907	0.10	Orbital height	CC ♂	15	31.2	2.68	0.693	8.59	25.0	35.0	0.954	0.50	2.67	0.354	1.19	0.249	CC ♀	5	32.8	1.64	0.735	5.01	30.0	34.0	0.779	0.05	Orbital breadth	CC ♂	14	43.8	2.03	0.543	4.64	42.0	48.0	0.801	<0.01	5.16	0.125	0.48	0.638	CC ♀	5	43.4	0.89	0.400	2.06	42.0	44.0	0.771	0.05																																																																																																																																																																																																																												
Auriculare-Basion	CC ♂	17	68.5	2.06	0.501	3.01	63.0	72.0	0.902	0.05	1.13	0.971	0.38	0.711																																																																																																																																																																																																																																																																																																																																																																																																																																				
	CC ♀	6	68.1	1.94	0.792	2.85	65.0	70.0	0.912	0.10					Auriculare-Asterion	CC ♂	17	55.0	5.24	1.272	9.53	45.0	63.0	0.961	0.50	3.93	0.100	2.85	0.090	CC ♀	7	49.0	2.64	1.000	5.40	46.0	52.0	0.851	0.10	Nasion-Nasospinale	CC ♂	14	54.2	3.19	0.854	5.89	50.0	59.0	0.894	0.05	1.17	0.746	2.06	0.054	CC ♀	6	51.0	3.46	1.414	6.79	45.0	54.0	0.857	0.10	Nasion-Prosthion	CC ♂	13	75.0	2.79	0.776	3.73	70.0	78.0	0.875	0.05	2.98	0.112	3.36	0.004	CC ♀	6	69.1	4.83	1.973	6.99	61.0	76.0	0.892	0.10	Nasospinale-Prosthion	CC ♂	14	20.3	2.79	0.746	13.70	17.0	26.0	0.917	0.10	2.24	0.330	1.89	0.075	CC ♀	7	18.1	1.86	0.705	10.27	16.0	21.0	0.889	0.10	Nasal breadth	CC ♂	15	29.5	1.35	0.350	4.59	27.0	32.0	0.955	0.50	3.26	0.064	1.91	0.071	CC ♀	7	28.0	2.44	0.926	8.75	25.0	32.0	0.907	0.10	Orbital height	CC ♂	15	31.2	2.68	0.693	8.59	25.0	35.0	0.954	0.50	2.67	0.354	1.19	0.249	CC ♀	5	32.8	1.64	0.735	5.01	30.0	34.0	0.779	0.05	Orbital breadth	CC ♂	14	43.8	2.03	0.543	4.64	42.0	48.0	0.801	<0.01	5.16	0.125	0.48	0.638	CC ♀	5	43.4	0.89	0.400	2.06	42.0	44.0	0.771	0.05																																																																																																																																																																																																																																																					
Auriculare-Asterion	CC ♂	17	55.0	5.24	1.272	9.53	45.0	63.0	0.961	0.50	3.93	0.100	2.85	0.090																																																																																																																																																																																																																																																																																																																																																																																																																																				
	CC ♀	7	49.0	2.64	1.000	5.40	46.0	52.0	0.851	0.10					Nasion-Nasospinale	CC ♂	14	54.2	3.19	0.854	5.89	50.0	59.0	0.894	0.05	1.17	0.746	2.06	0.054	CC ♀	6	51.0	3.46	1.414	6.79	45.0	54.0	0.857	0.10	Nasion-Prosthion	CC ♂	13	75.0	2.79	0.776	3.73	70.0	78.0	0.875	0.05	2.98	0.112	3.36	0.004	CC ♀	6	69.1	4.83	1.973	6.99	61.0	76.0	0.892	0.10	Nasospinale-Prosthion	CC ♂	14	20.3	2.79	0.746	13.70	17.0	26.0	0.917	0.10	2.24	0.330	1.89	0.075	CC ♀	7	18.1	1.86	0.705	10.27	16.0	21.0	0.889	0.10	Nasal breadth	CC ♂	15	29.5	1.35	0.350	4.59	27.0	32.0	0.955	0.50	3.26	0.064	1.91	0.071	CC ♀	7	28.0	2.44	0.926	8.75	25.0	32.0	0.907	0.10	Orbital height	CC ♂	15	31.2	2.68	0.693	8.59	25.0	35.0	0.954	0.50	2.67	0.354	1.19	0.249	CC ♀	5	32.8	1.64	0.735	5.01	30.0	34.0	0.779	0.05	Orbital breadth	CC ♂	14	43.8	2.03	0.543	4.64	42.0	48.0	0.801	<0.01	5.16	0.125	0.48	0.638	CC ♀	5	43.4	0.89	0.400	2.06	42.0	44.0	0.771	0.05																																																																																																																																																																																																																																																																														
Nasion-Nasospinale	CC ♂	14	54.2	3.19	0.854	5.89	50.0	59.0	0.894	0.05	1.17	0.746	2.06	0.054																																																																																																																																																																																																																																																																																																																																																																																																																																				
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	CC ♀	6	69.1	4.83	1.973	6.99	61.0	76.0	0.892	0.10					Nasospinale-Prosthion	CC ♂	14	20.3	2.79	0.746	13.70	17.0	26.0	0.917	0.10	2.24	0.330	1.89	0.075	CC ♀	7	18.1	1.86	0.705	10.27	16.0	21.0	0.889	0.10	Nasal breadth	CC ♂	15	29.5	1.35	0.350	4.59	27.0	32.0	0.955	0.50	3.26	0.064	1.91	0.071	CC ♀	7	28.0	2.44	0.926	8.75	25.0	32.0	0.907	0.10	Orbital height	CC ♂	15	31.2	2.68	0.693	8.59	25.0	35.0	0.954	0.50	2.67	0.354	1.19	0.249	CC ♀	5	32.8	1.64	0.735	5.01	30.0	34.0	0.779	0.05	Orbital breadth	CC ♂	14	43.8	2.03	0.543	4.64	42.0	48.0	0.801	<0.01	5.16	0.125	0.48	0.638	CC ♀	5	43.4	0.89	0.400	2.06	42.0	44.0	0.771	0.05																																																																																																																																																																																																																																																																																																																																
Nasospinale-Prosthion	CC ♂	14	20.3	2.79	0.746	13.70	17.0	26.0	0.917	0.10	2.24	0.330	1.89	0.075																																																																																																																																																																																																																																																																																																																																																																																																																																				
	CC ♀	7	18.1	1.86	0.705	10.27	16.0	21.0	0.889	0.10					Nasal breadth	CC ♂	15	29.5	1.35	0.350	4.59	27.0	32.0	0.955	0.50	3.26	0.064	1.91	0.071	CC ♀	7	28.0	2.44	0.926	8.75	25.0	32.0	0.907	0.10	Orbital height	CC ♂	15	31.2	2.68	0.693	8.59	25.0	35.0	0.954	0.50	2.67	0.354	1.19	0.249	CC ♀	5	32.8	1.64	0.735	5.01	30.0	34.0	0.779	0.05	Orbital breadth	CC ♂	14	43.8	2.03	0.543	4.64	42.0	48.0	0.801	<0.01	5.16	0.125	0.48	0.638	CC ♀	5	43.4	0.89	0.400	2.06	42.0	44.0	0.771	0.05																																																																																																																																																																																																																																																																																																																																																									
Nasal breadth	CC ♂	15	29.5	1.35	0.350	4.59	27.0	32.0	0.955	0.50	3.26	0.064	1.91	0.071																																																																																																																																																																																																																																																																																																																																																																																																																																				
	CC ♀	7	28.0	2.44	0.926	8.75	25.0	32.0	0.907	0.10					Orbital height	CC ♂	15	31.2	2.68	0.693	8.59	25.0	35.0	0.954	0.50	2.67	0.354	1.19	0.249	CC ♀	5	32.8	1.64	0.735	5.01	30.0	34.0	0.779	0.05	Orbital breadth	CC ♂	14	43.8	2.03	0.543	4.64	42.0	48.0	0.801	<0.01	5.16	0.125	0.48	0.638	CC ♀	5	43.4	0.89	0.400	2.06	42.0	44.0	0.771	0.05																																																																																																																																																																																																																																																																																																																																																																																		
Orbital height	CC ♂	15	31.2	2.68	0.693	8.59	25.0	35.0	0.954	0.50	2.67	0.354	1.19	0.249																																																																																																																																																																																																																																																																																																																																																																																																																																				
	CC ♀	5	32.8	1.64	0.735	5.01	30.0	34.0	0.779	0.05					Orbital breadth	CC ♂	14	43.8	2.03	0.543	4.64	42.0	48.0	0.801	<0.01	5.16	0.125	0.48	0.638	CC ♀	5	43.4	0.89	0.400	2.06	42.0	44.0	0.771	0.05																																																																																																																																																																																																																																																																																																																																																																																																											
Orbital breadth	CC ♂	14	43.8	2.03	0.543	4.64	42.0	48.0	0.801	<0.01	5.16	0.125	0.48	0.638																																																																																																																																																																																																																																																																																																																																																																																																																																				
	CC ♀	5	43.4	0.89	0.400	2.06	42.0	44.0	0.771	0.05																																																																																																																																																																																																																																																																																																																																																																																																																																								

		n	\bar{X}	s	SE	CV	Min.	Max.	W	P	F	P	T	P
Ectoconchion	CC ♂	13	108.6	3.52	0.977	3.24	104.0	114.0	0.924	0.10				
	CC ♀	5	104.4	2.60	1.166	2.50	101.0	107.0	0.902	0.10	1.82	0.592	2.46	0.026
Frontal arc	CC ♂	17	135.4	5.35	1.298	3.95	128.0	148.0	0.956	0.50				
	CC ♀	7	128.5	5.56	2.103	4.33	121.0	135.0	0.919	0.10	1.08	0.829	2.84	0.010
Parietal arc	CC ♂	17	135.4	7.06	1.713	5.21	117.0	143.0	0.866	0.01				
	CC ♀	7	130.2	4.38	1.658	3.37	123.0	135.0	0.924	0.10	2.59	0.245	1.79	0.087
Occipital arc	CC ♂	17	121.1	7.20	1.747	5.95	111.0	142.0	0.889	0.02				
	CC ♀	6	119.8	3.76	1.573	3.14	115.0	125.0	0.950	0.50	3.66	0.158	0.41	0.684
Alveolar length	CC ♂	14	64.9	2.64	0.707	4.07	61.0	69.0	0.943	0.10				
	CC ♀	7	61.1	4.14	1.565	6.77	57.0	70.0	0.761	0.02	2.45	0.165	2.56	0.019
Alveolar breadth	CC ♂	14	73.2	3.77	1.008	5.15	67.0	83.0	0.900	0.10				
	CC ♀	7	67.1	2.79	1.056	4.16	65.0	72.0	0.809	0.05	1.82	0.475	3.80	0.001
Mastoid depth	CC ♂	17	31.5	2.93	0.713	9.32	27.0	37.0	0.960	0.50				
	CC ♀	6	28.0	2.28	0.931	8.14	25.0	31.0	0.954	0.50	1.66	0.601	2.66	0.015
Mandible-Canine breadth	CC ♂	13	48.7	3.14	0.871	6.44	42.0	53.0	0.941	0.10				
	CC ♀	7	47.4	2.44	0.922	5.14	44.0	51.0	0.960	0.50	1.66	0.554	0.98	0.341
Parietal Subtense height	CC ♂	17	25.2	2.86	0.694	11.34	18.0	29.0	0.923	0.10				
	CC ♀	7	24.4	1.81	0.685	7.42	22.0	28.0	0.710	<0.01	2.49	0.265	0.69	0.500
Bregma-Parietal Subtense	CC ♂	17	61.8	4.99	1.210	8.07	54.0	72.0	0.964	0.50				
	CC ♀	7	59.2	4.15	1.569	7.00	55.0	66.0	0.902	0.10	1.44	0.681	1.18	0.249
Frontal curvature index	CC ♂	17	19.0	3.28	-	17.19	12.0	24.0	-	-				
	CC ♀	7	20.6	3.46	-	16.80	16.0	25.0	-	-	1.17	0.746	0.99	0.250
Parietal curvature index	CC ♂	17	20.7	1.68	-	8.12	15.0	23.0	-	-				
	CC ♀	7	20.8	1.98	-	9.52	18.0	24.0	-	-	1.17	0.746	0.12	0.850
Occipital curvature index	CC ♂	16	27.7	2.85	-	10.29	19.0	33.0	-	-				
	CC ♀	6	26.9	2.57	-	9.54	23.0	30.0	-	-	1.66	0.601	0.57	0.400
Gnathic index	CC ♂	13	104.6	3.23	-	3.09	98.0	108.0	-	-				
	CC ♀	5	105.8	4.49	-	4.24	100.0	112.0	-	-	1.62	0.409	0.83	0.250
Upper Facial index	CC ♂	5	52.4	0.97	-	1.85	51.0	54.0	-	-				
	CC ♀	2	53.5	4.50	-	8.41	50.0	57.0	-	-	-	-	-	-
Postorbital constriction	CC ♂	9	22.6	2.34	-	17.55	19.0	26.0	-	-				
	CC ♀	2	14.5	9.19	-	-	8.0	21.0	-	-	-	-	-	-
Palate module	CC ♂	13	47.0	3.07	-	6.52	41.0	55.0	-	-				
	CC ♀	7	41.0	3.43	-	8.36	37.0	47.0	-	-	1.22	0.690	3.79	0.001

Table 47
Descriptive statistics for the Murray Valley male and female crania (mm.)

		n	\bar{X}	s	SE	CV	Min.	Max.	W	P	F	P	T	P
Max. Bi-Parietal breadth	MV ♂	46	130.5	4.52	0.666	3.46	122.0	143.0	0.978	0.50				
	MV ♀	51	127.2	4.70	0.658	3.70	115.0	139.0	0.973	0.50	1.08	0.792	3.52	0.001
Glabella-Opisthocranion	MV ♂	47	189.1	5.76	0.840	3.04	178.0	201.0	0.962	0.10				
	MV ♀	52	179.8	5.02	0.696	2.80	169.0	192.0	0.979	0.50	1.31	0.341	8.55	0.000
Glabella-Lambda	MV ♂	47	184.3	5.76	0.840	3.12	170.0	198.0	0.992	0.99				
	MV ♀	53	174.6	4.88	0.671	2.80	163.0	188.0	0.979	0.50	1.39	0.250	9.06	0.000
Basion-Bregma	MV ♂	45	133.5	4.05	0.604	3.03	126.0	143.0	0.972	0.10				
	MV ♀	50	126.3	4.38	0.620	3.47	118.0	137.0	0.966	0.10	1.17	0.596	8.23	0.000
Basion-Nasion	MV ♂	45	102.5	3.29	0.490	3.21	95.0	108.0	0.956	0.10				
	MV ♀	50	96.2	3.92	0.555	4.08	83.0	104.0	0.951	0.05	1.43	0.233	8.33	0.000
Basion-Nasospinale	MV ♂	45	99.0	3.89	0.579	3.92	90.0	107.0	0.963	0.10				
	MV ♀	50	93.6	5.15	0.730	5.51	73.0	103.0	0.930	0.01	1.76	0.058	5.80*	0.000
Basion-Prosthion	MV ♂	45	106.5	4.38	0.653	4.11	95.0	116.0	0.962	0.10				
	MV ♀	50	100.2	5.66	0.802	5.66	83.0	110.0	0.946	0.02	1.68	0.084	6.05	0.000
Basion-Lambda	MV ♂	45	114.2	2.83	0.423	2.48	108.0	119.0	0.950	0.05				
	MV ♀	50	108.7	4.40	0.624	4.05	91.0	118.0	0.926	0.01	2.42	0.004	7.22*	0.000
Basion-Inion	MV ♂	43	81.5	4.93	0.753	6.05	69.0	91.0	0.969	0.10				
	MV ♀	50	73.9	7.81	1.105	10.57	40.0	90.0	0.864	<0.01	2.51	0.003	5.68*	0.000
Bi-Auriculare	MV ♂	47	121.3	4.23	0.618	3.49	112.0	131.0	0.967	0.10				
	MV ♀	52	115.5	4.89	0.679	4.24	104.0	126.0	0.984	0.50	1.34	0.321	6.23	0.000
Bi-Asterion	MV ♂	44	111.5	3.84	0.579	3.45	105.0	120.0	0.961	0.10				
	MV ♀	52	105.3	3.94	0.546	3.74	98.0	112.0	0.942	0.02	1.05	0.872	7.68	0.000
Bi-Sphenion	MV ♂	45	103.6	3.77	0.563	3.64	96.0	111.0	0.957	0.10				
	MV ♀	52	100.2	4.44	0.616	4.43	92.0	110.0	0.972	0.10	1.38	0.273	3.99	0.000
Glabella-Bregma	MV ♂	47	109.9	4.38	0.639	3.99	99.0	117.0	0.963	0.10				
	MV ♀	53	102.9	3.99	0.549	3.88	95.0	117.0	0.961	0.10	1.20	0.517	8.33	0.000
Nasion-Bregma	MV ♂	47	113.5	4.28	0.625	3.77	102.0	120.0	0.958	0.10				
	MV ♀	53	107.5	3.59	0.494	3.34	100.0	120.0	0.954	0.05	1.42	0.219	7.54	0.000
Metopion height	MV ♂	47	25.6	2.20	0.322	8.61	21.0	30.0	0.948	0.05				
	MV ♀	52	25.1	2.18	0.303	8.69	21.0	30.0	0.951	0.05	1.02	0.941	1.06	0.293
Nasion-Metopion	MV ♂	47	51.0	3.35	0.488	6.56	43.0	57.0	0.964	0.10				
	MV ♀	52	47.9	3.22	0.447	6.72	41.0	56.0	0.980	0.50	1.08	0.788	4.66	0.000
Max. Supraorbital br.	MV ♂	47	108.5	3.48	0.508	3.20	101.0	116.0	0.957	0.10				
	MV ♀	53	105.2	4.12	0.567	3.92	94.0	115.0	0.983	0.50	1.41	0.241	4.29	0.000
Max. Posterior Frontal br.	MV ♂	16	110.8	3.13	0.783	2.83	104.0	115.0	0.910	0.10				
	MV ♀	17	106.2	3.11	0.756	2.93	101.0	113.0	0.956	0.50	1.01	0.983	4.10	0.000

*T calculated using separate variance estimate

		n	\bar{X}	s	SE	CV	Min.	Max.	W	P	F	P	T	P
Min. Postorbital breadth	MV ♂	47	95.5	4.61	0.672	4.82	85.0	107.0	0.968	0.10				
	MV ♀	53	92.1	3.89	0.535	4.22	85.0	103.0	0.969	0.10	1.40	0.239	3.91	0.000
Min. Bi-Temporal lines	MV ♂	47	87.0	7.84	1.143	9.00	73.0	102.0	0.962	0.10				
	MV ♀	50	80.6	6.08	0.860	6.87	74.0	103.0	0.973	0.10	1.66	0.083	1.13	0.263
Bi-Zygion	MV ♂	44	135.6	5.01	0.755	3.69	124.0	146.0	0.981	0.50				
	MV ♀	50	126.5	4.53	0.641	3.58	118.0	138.0	0.964	0.10	1.22	0.496	9.19	0.000
Bi-Zygomaxillary	MV ♂	47	94.5	4.18	0.610	4.42	86.0	108.0	0.969	0.10				
	MV ♀	53	90.5	4.23	0.582	4.68	81.0	99.0	0.975	0.50	1.03	0.930	4.69	0.000
Bi-Stephanion	MV ♂	47	92.1	7.63	1.113	8.28	73.0	105.0	0.968	0.10				
	MV ♀	50	94.0	7.01	0.992	7.46	75.0	115.0	0.972	0.10	1.18	0.564	1.30	0.197
Bi-Stenionic	MV ♂	47	71.9	3.79	0.552	5.29	62.0	79.0	0.930	0.01				
	MV ♀	49	67.4	3.05	0.437	4.53	61.0	74.0	0.964	0.10	1.54	0.144	6.25	0.000
Opisthion-Inion	MV ♂	45	47.5	4.90	0.725	10.24	37.0	59.0	0.975	0.50				
	MV ♀	49	44.1	5.85	0.853	13.27	31.0	60.0	0.979	0.50	1.45	0.217	3.04	0.003
Opisthion-Lambda	MV ♂	46	94.5	3.48	0.514	3.69	88.0	109.0	0.901	<0.01				
	MV ♀	49	91.3	3.78	0.541	4.14	85.0	102.0	0.957	0.10	1.18	0.583	4.25	0.000
Opisthion-Asterion	MV ♂	46	65.9	3.05	0.451	4.64	61.0	78.0	0.913	<0.01				
	MV ♀	49	62.7	3.53	0.505	5.63	53.0	74.0	0.959	0.10	1.33	0.332	4.74	0.000
Opisthion-Glabella	MV ♂	44	145.5	5.16	0.778	3.54	134.0	159.0	0.970	0.10				
	MV ♀	46	136.3	4.45	0.657	3.27	128.0	146.0	0.969	0.10	1.34	0.331	9.09	0.000
Foramen Magnum length	MV ♂	43	36.1	1.70	0.260	4.73	33.0	41.0	0.939	0.02				
	MV ♀	48	34.2	2.21	0.319	6.45	30.0	41.0	0.944	0.02	1.68	0.091	4.37	0.000
Foramen Magnum breadth	MV ♂	44	30.4	2.37	0.358	7.81	24.0	35.0	0.952	0.10				
	MV ♀	48	29.3	2.13	0.307	7.25	25.0	35.0	0.966	0.10	1.24	0.463	2.25	0.027
Basion-Sphenobasion	MV ♂	42	21.8	2.16	0.334	9.90	15.0	28.0	0.955	0.10				
	MV ♀	50	20.7	1.73	0.245	8.33	17.0	25.0	0.964	0.10	1.57	0.131	2.71	0.008
Basion-Asterion	MV ♂	45	77.8	3.78	0.564	4.86	61.0	84.0	0.859	<0.01				
	MV ♀	50	73.7	3.10	0.439	4.21	65.0	82.0	0.976	0.50	1.48	0.180	5.80	0.000
Basion-Mastoidale	MV ♂	44	52.3	2.83	0.427	5.40	45.0	58.0	0.953	0.10				
	MV ♀	50	49.4	2.87	0.406	5.80	43.0	56.0	0.959	0.10	1.03	0.925	4.96	0.000
Basion-Staphylion	MV ♂	44	47.7	2.49	0.375	5.22	42.0	54.0	0.979	0.50				
	MV ♀	48	45.1	2.98	0.430	6.60	37.0	52.0	0.985	0.90	1.43	0.234	4.48	0.000
Lambda-Bregma	MV ♂	46	117.3	5.04	0.744	4.30	107.0	134.0	0.969	0.10				
	MV ♀	53	112.3	4.79	0.658	4.27	96.0	123.0	0.951	0.05	1.11	0.716	5.12	0.000
Lambda-Inion	MV ♂	47	61.1	5.25	0.766	3.59	47.0	73.0	0.979	0.50				
	MV ♀	52	59.2	5.92	0.822	10.00	47.0	77.0	0.963	0.10	1.27	0.410	1.66	0.100

		n	\bar{X}	s	SE	CV	Min.	Max.	W.	P	F	P	T	P
Lambda-Asterion	MV ♂	47	82.3	3.57	0.522	4.34	74.0	92.0	0.975	0.50				
	MV ♀	52	79.4	3.60	0.500	4.54	69.0	87.0	0.981	0.50	1.02	0.962	4.04	0.000
Auriculare-Bregma	MV ♂	47	123.4	4.01	0.585	3.25	112.0	132.0	0.980	0.50				
	MV ♀	53	117.8	3.88	0.533	3.38	112.0	131.0	0.934	0.01	1.07	0.816	7.04	0.000
Auriculare-Glabella	MV ♂	47	118.3	4.19	0.612	3.55	108.0	125.0	0.939	0.02				
	MV ♀	53	112.5	4.08	0.561	3.63	105.0	121.0	0.944	0.02	1.05	0.850	6.91	0.000
Auriculare-Nasion	MV ♂	47	119.9	4.30	0.628	3.85	101.0	118.0	0.928	0.01				
	MV ♀	53	106.5	3.77	0.519	3.55	99.0	114.0	0.954	0.05	1.30	0.356	6.69	0.000
Auriculare-Nasospinale	MV ♂	47	119.2	4.67	0.682	3.92	106.0	127.0	0.955	0.10				
	MV ♀	53	113.3	4.01	0.552	3.54	107.0	124.0	0.957	0.10	1.36	0.285	6.74	0.000
Auriculare-Prosthion	MV ♂	47	129.8	4.88	0.712	3.76	119.0	139.0	0.958	0.10				
	MV ♀	53	122.9	4.40	0.604	3.58	114.0	131.0	0.961	0.10	1.23	0.466	7.45	0.000
Auriculare-Zygomaxillary	MV ♂	47	78.4	4.11	0.600	5.24	70.0	87.0	0.976	0.50				
	MV ♀	53	74.5	3.63	0.499	4.87	69.0	85.0	0.959	0.10	1.28	0.388	4.96	0.000
Auriculare-Lambda	MV ♂	47	116.2	3.63	0.530	3.12	110.0	124.0	0.964	0.10				
	MV ♀	53	111.7	3.34	0.460	2.10	103.0	119.0	0.971	0.10	1.18	0.568	6.42	0.000
Auriculare-Inion	MV ♂	47	101.8	3.81	0.557	3.75	94.0	109.0	0.968	0.10				
	MV ♀	52	95.1	4.97	0.690	5.22	85.0	105.0	0.967	0.10	1.70	0.071	7.44	0.000
Auriculare-Opisthion	MV ♂	46	77.0	3.00	0.443	3.89	67.0	82.0	0.936	0.02				
	MV ♀	48	73.5	3.39	0.490	4.62	66.0	82.0	0.983	0.50	1.28	0.408	5.42	0.000
Auriculare-Basion	MV ♂	45	66.1	3.14	0.468	4.75	57.0	72.0	0.970	0.10				
	MV ♀	50	63.2	3.15	0.446	4.10	58.0	71.0	0.918	<0.01	1.01	0.982	4.60	0.000
Auriculare-Asterion	MV ♂	45	49.3	2.63	0.39	5.35	44.0	56.0	0.947	0.05				
	MV ♀	53	46.0	3.34	0.459	7.25	39.0	60.0	0.927	<0.01	1.61	0.109	5.22	0.000
Nasion-Nasospinale	MV ♂	47	49.9	2.66	0.388	5.33	44.0	55.0	0.968	0.10				
	MV ♀	53	47.3	2.54	0.350	5.37	42.0	53.0	0.952	0.05	1.09	0.750	4.92	0.000
Nasion-Prosthion	MV ♂	47	70.5	3.91	0.570	5.54	62.0	78.0	0.964	0.10				
	MV ♀	53	65.6	3.72	0.511	5.68	57.0	74.0	0.980	0.50	1.10	0.728	6.51	0.000
Nasospinale-Prosthion	MV ♂	47	20.7	2.85	0.416	13.77	15.0	27.0	0.968	0.10				
	MV ♀	53	18.2	2.86	0.393	15.74	11.0	25.0	0.949	0.05	1.01	0.978	4.36	0.000
Nasal breadth	MV ♂	47	28.3	2.07	0.303	7.33	24.0	34.0	0.950	0.05				
	MV ♀	53	26.4	1.92	0.265	6.55	23.0	33.0	0.937	0.01	1.17	0.590	4.86	0.000
Orbital height	MV ♂	47	32.9	2.50	0.365	7.61	23.0	39.0	0.915	<0.01				
	MV ♀	53	32.1	1.95	0.269	6.10	29.0	37.0	0.917	<0.01	1.64	0.085	1.84	0.069
Orbital breadth	MV ♂	47	44.5	1.97	0.288	4.44	40.0	48.0	0.955	0.10				
	MV ♀	53	42.3	1.67	0.230	3.95	38.0	47.0	0.962	0.10	1.40	0.244	6.12	0.000

		n	\bar{X}	s	SE	CV	Min.	Max.	W	P	F	P	T	P																																																																																																																																																																																																																																																																																																																																																																																																											
Bi-Ectoconchion	MV ♂	46	104.3	3.38	0.514	3.35	97.0	111.0	0.963	0.10	1.15	0.644	6.65	0.000																																																																																																																																																																																																																																																																																																																																																																																																											
	MV ♀	53	99.4	3.73	0.513	3.76	90.0	108.0	0.974	0.50					Frontal arc	MV ♂	46	130.2	5.59	0.824	4.29	115.0	140.0	0.960	0.10	1.37	0.277	6.21	0.000	MV ♀	51	123.7	4.77	0.669	3.86	114.0	140.0	0.969	0.10	Parietal arc	MV ♂	42	130.1	6.14	0.947	4.72	119.0	149.0	0.962	0.10	1.13	0.672	4.49	0.000	MV ♀	51	124.6	5.77	0.808	4.63	106.0	137.0	0.958	0.10	Occipital arc	MV ♂	43	113.6	4.95	0.755	4.36	105.0	123.0	0.951	0.10	1.36	0.315	3.40	0.001	MV ♀	49	109.8	5.76	0.824	5.25	100.0	129.0	0.928	<0.01	Alveolar length	MV ♂	47	64.1	3.98	0.581	6.20	56.0	73.0	0.970	0.10	1.50	0.155	6.65	0.000	MV ♀	53	59.1	3.24	0.446	5.47	53.0	67.0	0.970	0.10	Alveolar breadth	MV ♂	47	69.3	3.55	0.518	5.12	61.0	77.0	0.982	0.50	1.62	0.092	8.28	0.000	MV ♀	53	64.0	2.79	0.383	4.36	57.0	70.0	0.970	0.10	Mastoid depth	MV ♂	47	31.2	2.35	0.344	7.55	26.0	36.0	0.954	0.10	1.28	0.394	9.13	0.000	MV ♀	53	27.1	2.08	0.287	7.69	23.0	33.0	0.944	0.02	Bi-Canine breadth	MV ♂	47	46.5	2.33	0.340	5.01	41.0	51.0	0.964	0.10	1.05	0.857	5.82	0.000	MV ♀	53	43.7	2.39	0.329	5.47	39.0	49.0	0.966	0.10	Parietal Subtense height	MV ♂	44	23.3	1.93	0.292	8.31	20.0	28.0	0.936	0.02	1.12	0.702	0.73	0.464	MV ♀	52	23.0	2.05	0.285	8.92	16.0	27.0	0.925	<0.01	Bregma-Parietal Subtense	MV ♂	44	59.5	4.63	0.698	7.78	50.0	69.0	0.971	0.10	1.08	0.776	4.15	0.000	MV ♀	52	55.6	4.44	0.617	7.99	46.0	66.0	0.962	0.10	Frontal curvature index	MV ♂	47	22.6	1.57	-	6.95	19.0	26.0	-	-	1.40	0.244	1.347	0.100	MV ♀	52	23.4	1.81	-	7.74	20.0	28.0	-	-	Parietal curvature index	MV ♂	44	19.8	1.14	-	5.76	17.0	23.0	-	-	1.36	0.269	2.08	0.025	MV ♀	52	20.4	1.57	-	7.70	17.0	24.0	-	-	Occipital curvature index	MV ♂	40	29.3	3.45	-	11.77	24.0	37.0	-	-					MV ♀								-	-	Gnathic index	MV ♂	45	103.9	3.53	-	3.40	97.0	111.0	-	-	1.28	0.388	0.12	0.820	MV ♀	50	104.0	4.07	-	3.91	85.0	113.0	-	-	Upper facial index	MV ♂	44	52.2	3.23	-	6.19	47.0	60.0	-	-	1.28	0.408	0.46	0.730	MV ♀	49	51.9	2.95	-	5.68	43.0	61.0	-	-	Postorbital constriction	MV ♂	44	21.7	3.81	-	17.55	13.0	34.0	-	-	1.76	0.058	4.53	0.000	MV ♀	52	18.4	3.14	-	17.06	12.0	26.0	-	-	Palate module	MV ♂	47	44.5	4.32	-	9.71	36.0	53.0	-	-	1.39	0.250	8.47	0.000	MV ♀	53	38.0	3.25	-
Frontal arc	MV ♂	46	130.2	5.59	0.824	4.29	115.0	140.0	0.960	0.10	1.37	0.277	6.21	0.000																																																																																																																																																																																																																																																																																																																																																																																																											
	MV ♀	51	123.7	4.77	0.669	3.86	114.0	140.0	0.969	0.10					Parietal arc	MV ♂	42	130.1	6.14	0.947	4.72	119.0	149.0	0.962	0.10	1.13	0.672	4.49	0.000	MV ♀	51	124.6	5.77	0.808	4.63	106.0	137.0	0.958	0.10	Occipital arc	MV ♂	43	113.6	4.95	0.755	4.36	105.0	123.0	0.951	0.10	1.36	0.315	3.40	0.001	MV ♀	49	109.8	5.76	0.824	5.25	100.0	129.0	0.928	<0.01	Alveolar length	MV ♂	47	64.1	3.98	0.581	6.20	56.0	73.0	0.970	0.10	1.50	0.155	6.65	0.000	MV ♀	53	59.1	3.24	0.446	5.47	53.0	67.0	0.970	0.10	Alveolar breadth	MV ♂	47	69.3	3.55	0.518	5.12	61.0	77.0	0.982	0.50	1.62	0.092	8.28	0.000	MV ♀	53	64.0	2.79	0.383	4.36	57.0	70.0	0.970	0.10	Mastoid depth	MV ♂	47	31.2	2.35	0.344	7.55	26.0	36.0	0.954	0.10	1.28	0.394	9.13	0.000	MV ♀	53	27.1	2.08	0.287	7.69	23.0	33.0	0.944	0.02	Bi-Canine breadth	MV ♂	47	46.5	2.33	0.340	5.01	41.0	51.0	0.964	0.10	1.05	0.857	5.82	0.000	MV ♀	53	43.7	2.39	0.329	5.47	39.0	49.0	0.966	0.10	Parietal Subtense height	MV ♂	44	23.3	1.93	0.292	8.31	20.0	28.0	0.936	0.02	1.12	0.702	0.73	0.464	MV ♀	52	23.0	2.05	0.285	8.92	16.0	27.0	0.925	<0.01	Bregma-Parietal Subtense	MV ♂	44	59.5	4.63	0.698	7.78	50.0	69.0	0.971	0.10	1.08	0.776	4.15	0.000	MV ♀	52	55.6	4.44	0.617	7.99	46.0	66.0	0.962	0.10	Frontal curvature index	MV ♂	47	22.6	1.57	-	6.95	19.0	26.0	-	-	1.40	0.244	1.347	0.100	MV ♀	52	23.4	1.81	-	7.74	20.0	28.0	-	-	Parietal curvature index	MV ♂	44	19.8	1.14	-	5.76	17.0	23.0	-	-	1.36	0.269	2.08	0.025	MV ♀	52	20.4	1.57	-	7.70	17.0	24.0	-	-	Occipital curvature index	MV ♂	40	29.3	3.45	-	11.77	24.0	37.0	-	-					MV ♀								-	-	Gnathic index	MV ♂	45	103.9	3.53	-	3.40	97.0	111.0	-	-	1.28	0.388	0.12	0.820	MV ♀	50	104.0	4.07	-	3.91	85.0	113.0	-	-	Upper facial index	MV ♂	44	52.2	3.23	-	6.19	47.0	60.0	-	-	1.28	0.408	0.46	0.730	MV ♀	49	51.9	2.95	-	5.68	43.0	61.0	-	-	Postorbital constriction	MV ♂	44	21.7	3.81	-	17.55	13.0	34.0	-	-	1.76	0.058	4.53	0.000	MV ♀	52	18.4	3.14	-	17.06	12.0	26.0	-	-	Palate module	MV ♂	47	44.5	4.32	-	9.71	36.0	53.0	-	-	1.39	0.250	8.47	0.000	MV ♀	53	38.0	3.25	-	8.55	31.0	45.0	-	-																				
Parietal arc	MV ♂	42	130.1	6.14	0.947	4.72	119.0	149.0	0.962	0.10	1.13	0.672	4.49	0.000																																																																																																																																																																																																																																																																																																																																																																																																											
	MV ♀	51	124.6	5.77	0.808	4.63	106.0	137.0	0.958	0.10					Occipital arc	MV ♂	43	113.6	4.95	0.755	4.36	105.0	123.0	0.951	0.10	1.36	0.315	3.40	0.001	MV ♀	49	109.8	5.76	0.824	5.25	100.0	129.0	0.928	<0.01	Alveolar length	MV ♂	47	64.1	3.98	0.581	6.20	56.0	73.0	0.970	0.10	1.50	0.155	6.65	0.000	MV ♀	53	59.1	3.24	0.446	5.47	53.0	67.0	0.970	0.10	Alveolar breadth	MV ♂	47	69.3	3.55	0.518	5.12	61.0	77.0	0.982	0.50	1.62	0.092	8.28	0.000	MV ♀	53	64.0	2.79	0.383	4.36	57.0	70.0	0.970	0.10	Mastoid depth	MV ♂	47	31.2	2.35	0.344	7.55	26.0	36.0	0.954	0.10	1.28	0.394	9.13	0.000	MV ♀	53	27.1	2.08	0.287	7.69	23.0	33.0	0.944	0.02	Bi-Canine breadth	MV ♂	47	46.5	2.33	0.340	5.01	41.0	51.0	0.964	0.10	1.05	0.857	5.82	0.000	MV ♀	53	43.7	2.39	0.329	5.47	39.0	49.0	0.966	0.10	Parietal Subtense height	MV ♂	44	23.3	1.93	0.292	8.31	20.0	28.0	0.936	0.02	1.12	0.702	0.73	0.464	MV ♀	52	23.0	2.05	0.285	8.92	16.0	27.0	0.925	<0.01	Bregma-Parietal Subtense	MV ♂	44	59.5	4.63	0.698	7.78	50.0	69.0	0.971	0.10	1.08	0.776	4.15	0.000	MV ♀	52	55.6	4.44	0.617	7.99	46.0	66.0	0.962	0.10	Frontal curvature index	MV ♂	47	22.6	1.57	-	6.95	19.0	26.0	-	-	1.40	0.244	1.347	0.100	MV ♀	52	23.4	1.81	-	7.74	20.0	28.0	-	-	Parietal curvature index	MV ♂	44	19.8	1.14	-	5.76	17.0	23.0	-	-	1.36	0.269	2.08	0.025	MV ♀	52	20.4	1.57	-	7.70	17.0	24.0	-	-	Occipital curvature index	MV ♂	40	29.3	3.45	-	11.77	24.0	37.0	-	-					MV ♀								-	-	Gnathic index	MV ♂	45	103.9	3.53	-	3.40	97.0	111.0	-	-	1.28	0.388	0.12	0.820	MV ♀	50	104.0	4.07	-	3.91	85.0	113.0	-	-	Upper facial index	MV ♂	44	52.2	3.23	-	6.19	47.0	60.0	-	-	1.28	0.408	0.46	0.730	MV ♀	49	51.9	2.95	-	5.68	43.0	61.0	-	-	Postorbital constriction	MV ♂	44	21.7	3.81	-	17.55	13.0	34.0	-	-	1.76	0.058	4.53	0.000	MV ♀	52	18.4	3.14	-	17.06	12.0	26.0	-	-	Palate module	MV ♂	47	44.5	4.32	-	9.71	36.0	53.0	-	-	1.39	0.250	8.47	0.000	MV ♀	53	38.0	3.25	-	8.55	31.0	45.0	-	-																																													
Occipital arc	MV ♂	43	113.6	4.95	0.755	4.36	105.0	123.0	0.951	0.10	1.36	0.315	3.40	0.001																																																																																																																																																																																																																																																																																																																																																																																																											
	MV ♀	49	109.8	5.76	0.824	5.25	100.0	129.0	0.928	<0.01					Alveolar length	MV ♂	47	64.1	3.98	0.581	6.20	56.0	73.0	0.970	0.10	1.50	0.155	6.65	0.000	MV ♀	53	59.1	3.24	0.446	5.47	53.0	67.0	0.970	0.10	Alveolar breadth	MV ♂	47	69.3	3.55	0.518	5.12	61.0	77.0	0.982	0.50	1.62	0.092	8.28	0.000	MV ♀	53	64.0	2.79	0.383	4.36	57.0	70.0	0.970	0.10	Mastoid depth	MV ♂	47	31.2	2.35	0.344	7.55	26.0	36.0	0.954	0.10	1.28	0.394	9.13	0.000	MV ♀	53	27.1	2.08	0.287	7.69	23.0	33.0	0.944	0.02	Bi-Canine breadth	MV ♂	47	46.5	2.33	0.340	5.01	41.0	51.0	0.964	0.10	1.05	0.857	5.82	0.000	MV ♀	53	43.7	2.39	0.329	5.47	39.0	49.0	0.966	0.10	Parietal Subtense height	MV ♂	44	23.3	1.93	0.292	8.31	20.0	28.0	0.936	0.02	1.12	0.702	0.73	0.464	MV ♀	52	23.0	2.05	0.285	8.92	16.0	27.0	0.925	<0.01	Bregma-Parietal Subtense	MV ♂	44	59.5	4.63	0.698	7.78	50.0	69.0	0.971	0.10	1.08	0.776	4.15	0.000	MV ♀	52	55.6	4.44	0.617	7.99	46.0	66.0	0.962	0.10	Frontal curvature index	MV ♂	47	22.6	1.57	-	6.95	19.0	26.0	-	-	1.40	0.244	1.347	0.100	MV ♀	52	23.4	1.81	-	7.74	20.0	28.0	-	-	Parietal curvature index	MV ♂	44	19.8	1.14	-	5.76	17.0	23.0	-	-	1.36	0.269	2.08	0.025	MV ♀	52	20.4	1.57	-	7.70	17.0	24.0	-	-	Occipital curvature index	MV ♂	40	29.3	3.45	-	11.77	24.0	37.0	-	-					MV ♀								-	-	Gnathic index	MV ♂	45	103.9	3.53	-	3.40	97.0	111.0	-	-	1.28	0.388	0.12	0.820	MV ♀	50	104.0	4.07	-	3.91	85.0	113.0	-	-	Upper facial index	MV ♂	44	52.2	3.23	-	6.19	47.0	60.0	-	-	1.28	0.408	0.46	0.730	MV ♀	49	51.9	2.95	-	5.68	43.0	61.0	-	-	Postorbital constriction	MV ♂	44	21.7	3.81	-	17.55	13.0	34.0	-	-	1.76	0.058	4.53	0.000	MV ♀	52	18.4	3.14	-	17.06	12.0	26.0	-	-	Palate module	MV ♂	47	44.5	4.32	-	9.71	36.0	53.0	-	-	1.39	0.250	8.47	0.000	MV ♀	53	38.0	3.25	-	8.55	31.0	45.0	-	-																																																																						
Alveolar length	MV ♂	47	64.1	3.98	0.581	6.20	56.0	73.0	0.970	0.10	1.50	0.155	6.65	0.000																																																																																																																																																																																																																																																																																																																																																																																																											
	MV ♀	53	59.1	3.24	0.446	5.47	53.0	67.0	0.970	0.10					Alveolar breadth	MV ♂	47	69.3	3.55	0.518	5.12	61.0	77.0	0.982	0.50	1.62	0.092	8.28	0.000	MV ♀	53	64.0	2.79	0.383	4.36	57.0	70.0	0.970	0.10	Mastoid depth	MV ♂	47	31.2	2.35	0.344	7.55	26.0	36.0	0.954	0.10	1.28	0.394	9.13	0.000	MV ♀	53	27.1	2.08	0.287	7.69	23.0	33.0	0.944	0.02	Bi-Canine breadth	MV ♂	47	46.5	2.33	0.340	5.01	41.0	51.0	0.964	0.10	1.05	0.857	5.82	0.000	MV ♀	53	43.7	2.39	0.329	5.47	39.0	49.0	0.966	0.10	Parietal Subtense height	MV ♂	44	23.3	1.93	0.292	8.31	20.0	28.0	0.936	0.02	1.12	0.702	0.73	0.464	MV ♀	52	23.0	2.05	0.285	8.92	16.0	27.0	0.925	<0.01	Bregma-Parietal Subtense	MV ♂	44	59.5	4.63	0.698	7.78	50.0	69.0	0.971	0.10	1.08	0.776	4.15	0.000	MV ♀	52	55.6	4.44	0.617	7.99	46.0	66.0	0.962	0.10	Frontal curvature index	MV ♂	47	22.6	1.57	-	6.95	19.0	26.0	-	-	1.40	0.244	1.347	0.100	MV ♀	52	23.4	1.81	-	7.74	20.0	28.0	-	-	Parietal curvature index	MV ♂	44	19.8	1.14	-	5.76	17.0	23.0	-	-	1.36	0.269	2.08	0.025	MV ♀	52	20.4	1.57	-	7.70	17.0	24.0	-	-	Occipital curvature index	MV ♂	40	29.3	3.45	-	11.77	24.0	37.0	-	-					MV ♀								-	-	Gnathic index	MV ♂	45	103.9	3.53	-	3.40	97.0	111.0	-	-	1.28	0.388	0.12	0.820	MV ♀	50	104.0	4.07	-	3.91	85.0	113.0	-	-	Upper facial index	MV ♂	44	52.2	3.23	-	6.19	47.0	60.0	-	-	1.28	0.408	0.46	0.730	MV ♀	49	51.9	2.95	-	5.68	43.0	61.0	-	-	Postorbital constriction	MV ♂	44	21.7	3.81	-	17.55	13.0	34.0	-	-	1.76	0.058	4.53	0.000	MV ♀	52	18.4	3.14	-	17.06	12.0	26.0	-	-	Palate module	MV ♂	47	44.5	4.32	-	9.71	36.0	53.0	-	-	1.39	0.250	8.47	0.000	MV ♀	53	38.0	3.25	-	8.55	31.0	45.0	-	-																																																																																															
Alveolar breadth	MV ♂	47	69.3	3.55	0.518	5.12	61.0	77.0	0.982	0.50	1.62	0.092	8.28	0.000																																																																																																																																																																																																																																																																																																																																																																																																											
	MV ♀	53	64.0	2.79	0.383	4.36	57.0	70.0	0.970	0.10					Mastoid depth	MV ♂	47	31.2	2.35	0.344	7.55	26.0	36.0	0.954	0.10	1.28	0.394	9.13	0.000	MV ♀	53	27.1	2.08	0.287	7.69	23.0	33.0	0.944	0.02	Bi-Canine breadth	MV ♂	47	46.5	2.33	0.340	5.01	41.0	51.0	0.964	0.10	1.05	0.857	5.82	0.000	MV ♀	53	43.7	2.39	0.329	5.47	39.0	49.0	0.966	0.10	Parietal Subtense height	MV ♂	44	23.3	1.93	0.292	8.31	20.0	28.0	0.936	0.02	1.12	0.702	0.73	0.464	MV ♀	52	23.0	2.05	0.285	8.92	16.0	27.0	0.925	<0.01	Bregma-Parietal Subtense	MV ♂	44	59.5	4.63	0.698	7.78	50.0	69.0	0.971	0.10	1.08	0.776	4.15	0.000	MV ♀	52	55.6	4.44	0.617	7.99	46.0	66.0	0.962	0.10	Frontal curvature index	MV ♂	47	22.6	1.57	-	6.95	19.0	26.0	-	-	1.40	0.244	1.347	0.100	MV ♀	52	23.4	1.81	-	7.74	20.0	28.0	-	-	Parietal curvature index	MV ♂	44	19.8	1.14	-	5.76	17.0	23.0	-	-	1.36	0.269	2.08	0.025	MV ♀	52	20.4	1.57	-	7.70	17.0	24.0	-	-	Occipital curvature index	MV ♂	40	29.3	3.45	-	11.77	24.0	37.0	-	-					MV ♀								-	-	Gnathic index	MV ♂	45	103.9	3.53	-	3.40	97.0	111.0	-	-	1.28	0.388	0.12	0.820	MV ♀	50	104.0	4.07	-	3.91	85.0	113.0	-	-	Upper facial index	MV ♂	44	52.2	3.23	-	6.19	47.0	60.0	-	-	1.28	0.408	0.46	0.730	MV ♀	49	51.9	2.95	-	5.68	43.0	61.0	-	-	Postorbital constriction	MV ♂	44	21.7	3.81	-	17.55	13.0	34.0	-	-	1.76	0.058	4.53	0.000	MV ♀	52	18.4	3.14	-	17.06	12.0	26.0	-	-	Palate module	MV ♂	47	44.5	4.32	-	9.71	36.0	53.0	-	-	1.39	0.250	8.47	0.000	MV ♀	53	38.0	3.25	-	8.55	31.0	45.0	-	-																																																																																																																								
Mastoid depth	MV ♂	47	31.2	2.35	0.344	7.55	26.0	36.0	0.954	0.10	1.28	0.394	9.13	0.000																																																																																																																																																																																																																																																																																																																																																																																																											
	MV ♀	53	27.1	2.08	0.287	7.69	23.0	33.0	0.944	0.02					Bi-Canine breadth	MV ♂	47	46.5	2.33	0.340	5.01	41.0	51.0	0.964	0.10	1.05	0.857	5.82	0.000	MV ♀	53	43.7	2.39	0.329	5.47	39.0	49.0	0.966	0.10	Parietal Subtense height	MV ♂	44	23.3	1.93	0.292	8.31	20.0	28.0	0.936	0.02	1.12	0.702	0.73	0.464	MV ♀	52	23.0	2.05	0.285	8.92	16.0	27.0	0.925	<0.01	Bregma-Parietal Subtense	MV ♂	44	59.5	4.63	0.698	7.78	50.0	69.0	0.971	0.10	1.08	0.776	4.15	0.000	MV ♀	52	55.6	4.44	0.617	7.99	46.0	66.0	0.962	0.10	Frontal curvature index	MV ♂	47	22.6	1.57	-	6.95	19.0	26.0	-	-	1.40	0.244	1.347	0.100	MV ♀	52	23.4	1.81	-	7.74	20.0	28.0	-	-	Parietal curvature index	MV ♂	44	19.8	1.14	-	5.76	17.0	23.0	-	-	1.36	0.269	2.08	0.025	MV ♀	52	20.4	1.57	-	7.70	17.0	24.0	-	-	Occipital curvature index	MV ♂	40	29.3	3.45	-	11.77	24.0	37.0	-	-					MV ♀								-	-	Gnathic index	MV ♂	45	103.9	3.53	-	3.40	97.0	111.0	-	-	1.28	0.388	0.12	0.820	MV ♀	50	104.0	4.07	-	3.91	85.0	113.0	-	-	Upper facial index	MV ♂	44	52.2	3.23	-	6.19	47.0	60.0	-	-	1.28	0.408	0.46	0.730	MV ♀	49	51.9	2.95	-	5.68	43.0	61.0	-	-	Postorbital constriction	MV ♂	44	21.7	3.81	-	17.55	13.0	34.0	-	-	1.76	0.058	4.53	0.000	MV ♀	52	18.4	3.14	-	17.06	12.0	26.0	-	-	Palate module	MV ♂	47	44.5	4.32	-	9.71	36.0	53.0	-	-	1.39	0.250	8.47	0.000	MV ♀	53	38.0	3.25	-	8.55	31.0	45.0	-	-																																																																																																																																																	
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Table 48
Descriptive statistics for the Swanport male and female crania (mm.)

		n	\bar{X}	s	SE	CV	Min.	Max.	W	P	F	P	T	P
Max. Bi-Parietal breadth	SW ♂	23	129.9	2.93	0.612	2.26	126.0	135.0	0.916	0.05				
	SW ♀	25	126.5	4.19	0.839	3.31	116.0	135.0	0.945	0.10	2.04	0.098	3.22	0.002
Glabella-Opisthocranion	SW ♂	23	189.1	5.33	1.112	2.82	180.0	200.0	0.973	0.50				
	SW ♀	23	181.5	6.06	1.265	3.35	169.0	191.0	0.959	0.10	1.29	0.550	4.54	0.000
Glabella-Lambda	SW ♂	23	182.1	5.28	1.101	2.90	175.0	196.0	0.928	0.10				
	SW ♀	23	174.0	5.64	1.178	3.25	162.0	182.0	0.944	0.10	1.14	0.754	5.07	0.000
Basion-Bregma	SW ♂	22	128.9	4.82	1.029	3.74	121.0	139.0	0.971	0.50				
	SW ♀	25	124.2	4.34	0.870	3.50	118.0	133.0	0.892	0.01	1.23	0.620	3.55	0.001
Basion-Nasion	SW ♂	22	101.4	3.51	0.749	3.46	95.0	106.0	0.930	0.10				
	SW ♀	25	95.8	3.09	0.618	3.22	90.0	102.0	0.972	0.50	1.29	0.542	5.78	0.000
Basion-Nasospinale	SW ♂	22	99.0	3.90	0.833	3.95	90.0	104.0	0.895	0.02				
	SW ♀	24	93.2	4.13	0.845	4.44	82.0	101.0	0.929	0.05	1.12	0.797	4.91	0.000
Basion-Prosthion	SW ♂	21	104.5	4.77	1.041	4.56	96.0	114.0	0.970	0.50				
	SW ♀	24	100.1	3.71	0.757	3.70	95.0	107.0	0.935	0.10	1.65	0.246	3.47	0.001
Basion-Lambda	SW ♂	17	110.5	6.15	1.493	5.56	94.0	120.0	0.889	0.02				
	SW ♀	23	108.4	5.86	1.224	3.71	90.0	118.0	0.916	0.05	1.10	0.820	1.10	0.278
Basion-Inion	SW ♂	17	72.1	3.30	0.801	4.57	66.0	79.0	0.962	0.50				
	SW ♀	22	70.1	3.68	0.785	5.25	64.0	80.0	0.949	0.10	1.24	0.665	1.79	0.081
Bi-Auriculare	SW ♂	17	120.5	3.89	0.943	3.22	113.0	128.0	0.946	0.10				
	SW ♀	22	115.3	4.58	0.977	3.97	108.0	124.0	0.948	0.10	1.39	0.508	3.77	0.001
Bi-Asterion	SW ♂	18	109.6	3.43	0.808	3.13	104.0	117.0	0.979	0.90				
	SW ♀	23	105.0	3.94	0.823	3.76	99.0	112.0	0.950	0.10	1.33	0.559	3.94	0.000
Bi-Sphenion	SW ♂	22	101.4	3.98	0.849	3.93	96.0	110.0	0.936	0.10				
	SW ♀	24	98.4	3.76	0.768	3.82	92.0	106.0	0.953	0.10	1.12	0.788	2.58	0.013
Glabella-Bregma	SW ♂	23	109.3	3.43	0.715	3.14	102.0	116.0	0.982	0.90				
	SW ♀	23	102.5	4.30	0.898	4.19	95.0	111.0	0.958	0.50	1.57	0.294	5.87	0.000
Nasion-Bregma	SW ♂	23	112.3	3.14	0.655	2.79	106.0	118.0	0.973	0.50				
	SW ♀	25	106.5	3.78	0.757	3.55	100.0	113.0	0.971	0.50	1.46	0.380	5.73	0.000
Metopion height	SW ♂	23	25.1	2.26	0.473	9.01	20.0	30.0	0.968	0.50				
	SW ♀	23	25.8	2.01	0.420	7.80	19.0	29.0	0.814	0.01	1.27	0.581	1.03	0.308
Nasion-Metopion	SW ♂	23	49.9	2.95	0.616	5.92	44.0	56.0	0.958	0.10				
	SW ♀	23	46.0	3.26	0.680	7.07	41.0	53.0	0.961	0.10	1.22	0.646	4.17	0.000
Max. Supraorbital breadth	SW ♂	23	109.7	3.76	0.786	3.43	101.0	116.0	0.955	0.10				
	SW ♀	25	104.7	2.89	0.579	2.76	100.0	110.0	0.949	0.10	1.70	0.210	5.20	0.000
Max. Posterior Frontal br.	SW ♂	7	111.1	4.88	1.844	4.39	106.0	118.0	0.880	0.10				
	SW ♀	6	107.3	1.03	0.422	0.96	106.0	109.0	0.961	0.50	22.32	0.004	2.01*	0.84

*T calculated using separate variance estimate

		n	\bar{X}	s	SE	CV	Min.	Max.	W	P	F	P	T	P																																																																																																																																																																																																																																																																																																																																																																																																																																				
Min. Postorbital breadth	SW ♂	23	95.5	4.09	0.855	4.29	88.0	102.0	0.962	0.50	1.79	0.166	1.78	0.082																																																																																																																																																																																																																																																																																																																																																																																																																																				
	SW ♀	25	93.7	3.06	0.612	3.26	88.0	101.0	0.974	0.50					Min. Bi-Temporal lines	SW ♂	18	85.9	10.60	2.499	12.34	63.0	102.0	0.972	0.50	2.95	0.032	1.50*	0.146	SW ♀	18	90.2	6.17	1.455	6.83	78.0	101.0	0.971	0.50	Bi-Zygion	SW ♂	18	136.8	3.02	0.713	2.21	133.0	143.0	0.934	0.10	3.19	0.018	7.15*	0.000	SW ♀	23	127.3	5.40	1.127	4.25	118.0	135.0	0.932	0.10	Bi-Zygomaxillary	SW ♂	23	96.8	4.02	0.840	4.15	89.0	104.0	0.977	0.50	1.35	0.477	2.91	0.006	SW ♀	25	93.7	3.47	0.694	3.70	88.0	101.0	0.963	0.10	Bi-Stephanion	SW ♂	18	92.7	10.04	2.360	10.83	70.0	104.0	0.900	0.05	2.23	0.100	1.04	0.305	SW ♀	19	95.6	6.72	1.543	7.03	84.0	106.0	0.945	0.10	Bi-Stenionic	SW ♂	16	71.5	3.20	0.801	4.48	63.0	76.0	0.898	0.05	1.52	0.369	4.48	0.000	SW ♀	22	67.0	2.59	0.554	3.87	63.0	72.0	0.939	0.10	Opisthion-Inion	SW ♂	18	37.7	4.26	1.005	11.29	30.0	45.0	0.957	0.50	3.10	0.021	0.98*	0.332	SW ♀	23	39.6	7.51	1.566	18.96	31.0	69.0	0.939	0.10	Opisthion-Lambda	SW ♂	18	92.6	3.66	0.864	3.96	87.0	98.0	0.928	0.10	3.83	0.007	1.66*	0.105	SW ♀	23	89.7	7.16	1.495	7.98	66.0	100.0	0.868	0.01	Opisthion-Asterion	SW ♂	18	62.6	3.19	0.754	5.10	57.0	68.0	0.961	0.50	2.68	0.042	0.21*	0.837	SW ♀	23	62.3	5.23	1.092	8.39	46.0	75.0	0.872	<0.01	Opisthion-Glabella	SW ♂	18	143.8	4.88	1.152	3.39	136.0	152.0	0.950	0.10	1.22	0.681	4.09	0.000	SW ♀	21	137.0	5.40	1.179	3.94	128.0	146.0	0.959	0.10	Basion-Asterion	SW ♂	17	75.2	3.72	0.902	4.94	69.0	80.0	0.925	0.02	2.47	0.050	2.06*	0.050	SW ♀	23	73.1	2.36	0.494	2.23	69.0	78.0	0.956	0.10	Basion-Mastoidale	SW ♂	17	53.4	2.55	0.619	4.77	49.0	58.0	0.975	0.50	1.11	0.809	4.52	0.000	SW ♀	23	49.8	2.42	0.506	4.86	45.0	54.0	0.965	0.50	Basion-Staphylion	SW ♂	17	47.8	3.23	0.785	6.76	41.0	53.0	0.967	0.50	2.39	0.059	2.92*	0.007	SW ♀	23	45.2	2.09	0.437	4.62	42.0	50.0	0.961	0.10	Lambda-Bregma	SW ♂	18	114.2	4.68	1.105	4.10	107.0	124.0	0.962	0.50	1.60	0.328	2.07	0.045	SW ♀	23	110.7	5.92	1.236	5.35	98.0	119.0	0.947	0.10	Lambda-Inion	SW ♂	17	66.6	5.53	1.342	8.30	58.0	76.0	0.963	0.50	1.73	0.263	1.85	0.072	SW ♀	23	62.7	7.28	1.518	11.60	39.0	75.0	0.892	0.01	Lambda-Asterion	SW ♂	18	83.1	3.14	0.740	3.78	77.0	89.0	0.979	0.90	1.95	0.163	1.90	0.065	SW ♀	23	80.7	4.39	0.915	5.43	73.0	88.0	0.961	0.10	Auriculare-Zygomaxillary	SW ♂	18	76.8	2.65	0.626	3.45	72.0	80.0	0.873	0.01	1.34	0.545	3.84	0.006	SW ♀	23	73.3	3.07	0.640	4.18	68.0	80.0	0.969	0.50	Auriculare-Opisthion	SW ♂	18	75.2	4.52	1.066	6.00	67.0	82.0	0.895	0.02	1.02	0.951	1.49	0.145	SW ♀	23	73.1	4.47	0.934
Min. Bi-Temporal lines	SW ♂	18	85.9	10.60	2.499	12.34	63.0	102.0	0.972	0.50	2.95	0.032	1.50*	0.146																																																																																																																																																																																																																																																																																																																																																																																																																																				
	SW ♀	18	90.2	6.17	1.455	6.83	78.0	101.0	0.971	0.50					Bi-Zygion	SW ♂	18	136.8	3.02	0.713	2.21	133.0	143.0	0.934	0.10	3.19	0.018	7.15*	0.000	SW ♀	23	127.3	5.40	1.127	4.25	118.0	135.0	0.932	0.10	Bi-Zygomaxillary	SW ♂	23	96.8	4.02	0.840	4.15	89.0	104.0	0.977	0.50	1.35	0.477	2.91	0.006	SW ♀	25	93.7	3.47	0.694	3.70	88.0	101.0	0.963	0.10	Bi-Stephanion	SW ♂	18	92.7	10.04	2.360	10.83	70.0	104.0	0.900	0.05	2.23	0.100	1.04	0.305	SW ♀	19	95.6	6.72	1.543	7.03	84.0	106.0	0.945	0.10	Bi-Stenionic	SW ♂	16	71.5	3.20	0.801	4.48	63.0	76.0	0.898	0.05	1.52	0.369	4.48	0.000	SW ♀	22	67.0	2.59	0.554	3.87	63.0	72.0	0.939	0.10	Opisthion-Inion	SW ♂	18	37.7	4.26	1.005	11.29	30.0	45.0	0.957	0.50	3.10	0.021	0.98*	0.332	SW ♀	23	39.6	7.51	1.566	18.96	31.0	69.0	0.939	0.10	Opisthion-Lambda	SW ♂	18	92.6	3.66	0.864	3.96	87.0	98.0	0.928	0.10	3.83	0.007	1.66*	0.105	SW ♀	23	89.7	7.16	1.495	7.98	66.0	100.0	0.868	0.01	Opisthion-Asterion	SW ♂	18	62.6	3.19	0.754	5.10	57.0	68.0	0.961	0.50	2.68	0.042	0.21*	0.837	SW ♀	23	62.3	5.23	1.092	8.39	46.0	75.0	0.872	<0.01	Opisthion-Glabella	SW ♂	18	143.8	4.88	1.152	3.39	136.0	152.0	0.950	0.10	1.22	0.681	4.09	0.000	SW ♀	21	137.0	5.40	1.179	3.94	128.0	146.0	0.959	0.10	Basion-Asterion	SW ♂	17	75.2	3.72	0.902	4.94	69.0	80.0	0.925	0.02	2.47	0.050	2.06*	0.050	SW ♀	23	73.1	2.36	0.494	2.23	69.0	78.0	0.956	0.10	Basion-Mastoidale	SW ♂	17	53.4	2.55	0.619	4.77	49.0	58.0	0.975	0.50	1.11	0.809	4.52	0.000	SW ♀	23	49.8	2.42	0.506	4.86	45.0	54.0	0.965	0.50	Basion-Staphylion	SW ♂	17	47.8	3.23	0.785	6.76	41.0	53.0	0.967	0.50	2.39	0.059	2.92*	0.007	SW ♀	23	45.2	2.09	0.437	4.62	42.0	50.0	0.961	0.10	Lambda-Bregma	SW ♂	18	114.2	4.68	1.105	4.10	107.0	124.0	0.962	0.50	1.60	0.328	2.07	0.045	SW ♀	23	110.7	5.92	1.236	5.35	98.0	119.0	0.947	0.10	Lambda-Inion	SW ♂	17	66.6	5.53	1.342	8.30	58.0	76.0	0.963	0.50	1.73	0.263	1.85	0.072	SW ♀	23	62.7	7.28	1.518	11.60	39.0	75.0	0.892	0.01	Lambda-Asterion	SW ♂	18	83.1	3.14	0.740	3.78	77.0	89.0	0.979	0.90	1.95	0.163	1.90	0.065	SW ♀	23	80.7	4.39	0.915	5.43	73.0	88.0	0.961	0.10	Auriculare-Zygomaxillary	SW ♂	18	76.8	2.65	0.626	3.45	72.0	80.0	0.873	0.01	1.34	0.545	3.84	0.006	SW ♀	23	73.3	3.07	0.640	4.18	68.0	80.0	0.969	0.50	Auriculare-Opisthion	SW ♂	18	75.2	4.52	1.066	6.00	67.0	82.0	0.895	0.02	1.02	0.951	1.49	0.145	SW ♀	23	73.1	4.47	0.934	6.12	61.0	83.0	0.965	0.50																				
Bi-Zygion	SW ♂	18	136.8	3.02	0.713	2.21	133.0	143.0	0.934	0.10	3.19	0.018	7.15*	0.000																																																																																																																																																																																																																																																																																																																																																																																																																																				
	SW ♀	23	127.3	5.40	1.127	4.25	118.0	135.0	0.932	0.10					Bi-Zygomaxillary	SW ♂	23	96.8	4.02	0.840	4.15	89.0	104.0	0.977	0.50	1.35	0.477	2.91	0.006	SW ♀	25	93.7	3.47	0.694	3.70	88.0	101.0	0.963	0.10	Bi-Stephanion	SW ♂	18	92.7	10.04	2.360	10.83	70.0	104.0	0.900	0.05	2.23	0.100	1.04	0.305	SW ♀	19	95.6	6.72	1.543	7.03	84.0	106.0	0.945	0.10	Bi-Stenionic	SW ♂	16	71.5	3.20	0.801	4.48	63.0	76.0	0.898	0.05	1.52	0.369	4.48	0.000	SW ♀	22	67.0	2.59	0.554	3.87	63.0	72.0	0.939	0.10	Opisthion-Inion	SW ♂	18	37.7	4.26	1.005	11.29	30.0	45.0	0.957	0.50	3.10	0.021	0.98*	0.332	SW ♀	23	39.6	7.51	1.566	18.96	31.0	69.0	0.939	0.10	Opisthion-Lambda	SW ♂	18	92.6	3.66	0.864	3.96	87.0	98.0	0.928	0.10	3.83	0.007	1.66*	0.105	SW ♀	23	89.7	7.16	1.495	7.98	66.0	100.0	0.868	0.01	Opisthion-Asterion	SW ♂	18	62.6	3.19	0.754	5.10	57.0	68.0	0.961	0.50	2.68	0.042	0.21*	0.837	SW ♀	23	62.3	5.23	1.092	8.39	46.0	75.0	0.872	<0.01	Opisthion-Glabella	SW ♂	18	143.8	4.88	1.152	3.39	136.0	152.0	0.950	0.10	1.22	0.681	4.09	0.000	SW ♀	21	137.0	5.40	1.179	3.94	128.0	146.0	0.959	0.10	Basion-Asterion	SW ♂	17	75.2	3.72	0.902	4.94	69.0	80.0	0.925	0.02	2.47	0.050	2.06*	0.050	SW ♀	23	73.1	2.36	0.494	2.23	69.0	78.0	0.956	0.10	Basion-Mastoidale	SW ♂	17	53.4	2.55	0.619	4.77	49.0	58.0	0.975	0.50	1.11	0.809	4.52	0.000	SW ♀	23	49.8	2.42	0.506	4.86	45.0	54.0	0.965	0.50	Basion-Staphylion	SW ♂	17	47.8	3.23	0.785	6.76	41.0	53.0	0.967	0.50	2.39	0.059	2.92*	0.007	SW ♀	23	45.2	2.09	0.437	4.62	42.0	50.0	0.961	0.10	Lambda-Bregma	SW ♂	18	114.2	4.68	1.105	4.10	107.0	124.0	0.962	0.50	1.60	0.328	2.07	0.045	SW ♀	23	110.7	5.92	1.236	5.35	98.0	119.0	0.947	0.10	Lambda-Inion	SW ♂	17	66.6	5.53	1.342	8.30	58.0	76.0	0.963	0.50	1.73	0.263	1.85	0.072	SW ♀	23	62.7	7.28	1.518	11.60	39.0	75.0	0.892	0.01	Lambda-Asterion	SW ♂	18	83.1	3.14	0.740	3.78	77.0	89.0	0.979	0.90	1.95	0.163	1.90	0.065	SW ♀	23	80.7	4.39	0.915	5.43	73.0	88.0	0.961	0.10	Auriculare-Zygomaxillary	SW ♂	18	76.8	2.65	0.626	3.45	72.0	80.0	0.873	0.01	1.34	0.545	3.84	0.006	SW ♀	23	73.3	3.07	0.640	4.18	68.0	80.0	0.969	0.50	Auriculare-Opisthion	SW ♂	18	75.2	4.52	1.066	6.00	67.0	82.0	0.895	0.02	1.02	0.951	1.49	0.145	SW ♀	23	73.1	4.47	0.934	6.12	61.0	83.0	0.965	0.50																																													
Bi-Zygomaxillary	SW ♂	23	96.8	4.02	0.840	4.15	89.0	104.0	0.977	0.50	1.35	0.477	2.91	0.006																																																																																																																																																																																																																																																																																																																																																																																																																																				
	SW ♀	25	93.7	3.47	0.694	3.70	88.0	101.0	0.963	0.10					Bi-Stephanion	SW ♂	18	92.7	10.04	2.360	10.83	70.0	104.0	0.900	0.05	2.23	0.100	1.04	0.305	SW ♀	19	95.6	6.72	1.543	7.03	84.0	106.0	0.945	0.10	Bi-Stenionic	SW ♂	16	71.5	3.20	0.801	4.48	63.0	76.0	0.898	0.05	1.52	0.369	4.48	0.000	SW ♀	22	67.0	2.59	0.554	3.87	63.0	72.0	0.939	0.10	Opisthion-Inion	SW ♂	18	37.7	4.26	1.005	11.29	30.0	45.0	0.957	0.50	3.10	0.021	0.98*	0.332	SW ♀	23	39.6	7.51	1.566	18.96	31.0	69.0	0.939	0.10	Opisthion-Lambda	SW ♂	18	92.6	3.66	0.864	3.96	87.0	98.0	0.928	0.10	3.83	0.007	1.66*	0.105	SW ♀	23	89.7	7.16	1.495	7.98	66.0	100.0	0.868	0.01	Opisthion-Asterion	SW ♂	18	62.6	3.19	0.754	5.10	57.0	68.0	0.961	0.50	2.68	0.042	0.21*	0.837	SW ♀	23	62.3	5.23	1.092	8.39	46.0	75.0	0.872	<0.01	Opisthion-Glabella	SW ♂	18	143.8	4.88	1.152	3.39	136.0	152.0	0.950	0.10	1.22	0.681	4.09	0.000	SW ♀	21	137.0	5.40	1.179	3.94	128.0	146.0	0.959	0.10	Basion-Asterion	SW ♂	17	75.2	3.72	0.902	4.94	69.0	80.0	0.925	0.02	2.47	0.050	2.06*	0.050	SW ♀	23	73.1	2.36	0.494	2.23	69.0	78.0	0.956	0.10	Basion-Mastoidale	SW ♂	17	53.4	2.55	0.619	4.77	49.0	58.0	0.975	0.50	1.11	0.809	4.52	0.000	SW ♀	23	49.8	2.42	0.506	4.86	45.0	54.0	0.965	0.50	Basion-Staphylion	SW ♂	17	47.8	3.23	0.785	6.76	41.0	53.0	0.967	0.50	2.39	0.059	2.92*	0.007	SW ♀	23	45.2	2.09	0.437	4.62	42.0	50.0	0.961	0.10	Lambda-Bregma	SW ♂	18	114.2	4.68	1.105	4.10	107.0	124.0	0.962	0.50	1.60	0.328	2.07	0.045	SW ♀	23	110.7	5.92	1.236	5.35	98.0	119.0	0.947	0.10	Lambda-Inion	SW ♂	17	66.6	5.53	1.342	8.30	58.0	76.0	0.963	0.50	1.73	0.263	1.85	0.072	SW ♀	23	62.7	7.28	1.518	11.60	39.0	75.0	0.892	0.01	Lambda-Asterion	SW ♂	18	83.1	3.14	0.740	3.78	77.0	89.0	0.979	0.90	1.95	0.163	1.90	0.065	SW ♀	23	80.7	4.39	0.915	5.43	73.0	88.0	0.961	0.10	Auriculare-Zygomaxillary	SW ♂	18	76.8	2.65	0.626	3.45	72.0	80.0	0.873	0.01	1.34	0.545	3.84	0.006	SW ♀	23	73.3	3.07	0.640	4.18	68.0	80.0	0.969	0.50	Auriculare-Opisthion	SW ♂	18	75.2	4.52	1.066	6.00	67.0	82.0	0.895	0.02	1.02	0.951	1.49	0.145	SW ♀	23	73.1	4.47	0.934	6.12	61.0	83.0	0.965	0.50																																																																						
Bi-Stephanion	SW ♂	18	92.7	10.04	2.360	10.83	70.0	104.0	0.900	0.05	2.23	0.100	1.04	0.305																																																																																																																																																																																																																																																																																																																																																																																																																																				
	SW ♀	19	95.6	6.72	1.543	7.03	84.0	106.0	0.945	0.10					Bi-Stenionic	SW ♂	16	71.5	3.20	0.801	4.48	63.0	76.0	0.898	0.05	1.52	0.369	4.48	0.000	SW ♀	22	67.0	2.59	0.554	3.87	63.0	72.0	0.939	0.10	Opisthion-Inion	SW ♂	18	37.7	4.26	1.005	11.29	30.0	45.0	0.957	0.50	3.10	0.021	0.98*	0.332	SW ♀	23	39.6	7.51	1.566	18.96	31.0	69.0	0.939	0.10	Opisthion-Lambda	SW ♂	18	92.6	3.66	0.864	3.96	87.0	98.0	0.928	0.10	3.83	0.007	1.66*	0.105	SW ♀	23	89.7	7.16	1.495	7.98	66.0	100.0	0.868	0.01	Opisthion-Asterion	SW ♂	18	62.6	3.19	0.754	5.10	57.0	68.0	0.961	0.50	2.68	0.042	0.21*	0.837	SW ♀	23	62.3	5.23	1.092	8.39	46.0	75.0	0.872	<0.01	Opisthion-Glabella	SW ♂	18	143.8	4.88	1.152	3.39	136.0	152.0	0.950	0.10	1.22	0.681	4.09	0.000	SW ♀	21	137.0	5.40	1.179	3.94	128.0	146.0	0.959	0.10	Basion-Asterion	SW ♂	17	75.2	3.72	0.902	4.94	69.0	80.0	0.925	0.02	2.47	0.050	2.06*	0.050	SW ♀	23	73.1	2.36	0.494	2.23	69.0	78.0	0.956	0.10	Basion-Mastoidale	SW ♂	17	53.4	2.55	0.619	4.77	49.0	58.0	0.975	0.50	1.11	0.809	4.52	0.000	SW ♀	23	49.8	2.42	0.506	4.86	45.0	54.0	0.965	0.50	Basion-Staphylion	SW ♂	17	47.8	3.23	0.785	6.76	41.0	53.0	0.967	0.50	2.39	0.059	2.92*	0.007	SW ♀	23	45.2	2.09	0.437	4.62	42.0	50.0	0.961	0.10	Lambda-Bregma	SW ♂	18	114.2	4.68	1.105	4.10	107.0	124.0	0.962	0.50	1.60	0.328	2.07	0.045	SW ♀	23	110.7	5.92	1.236	5.35	98.0	119.0	0.947	0.10	Lambda-Inion	SW ♂	17	66.6	5.53	1.342	8.30	58.0	76.0	0.963	0.50	1.73	0.263	1.85	0.072	SW ♀	23	62.7	7.28	1.518	11.60	39.0	75.0	0.892	0.01	Lambda-Asterion	SW ♂	18	83.1	3.14	0.740	3.78	77.0	89.0	0.979	0.90	1.95	0.163	1.90	0.065	SW ♀	23	80.7	4.39	0.915	5.43	73.0	88.0	0.961	0.10	Auriculare-Zygomaxillary	SW ♂	18	76.8	2.65	0.626	3.45	72.0	80.0	0.873	0.01	1.34	0.545	3.84	0.006	SW ♀	23	73.3	3.07	0.640	4.18	68.0	80.0	0.969	0.50	Auriculare-Opisthion	SW ♂	18	75.2	4.52	1.066	6.00	67.0	82.0	0.895	0.02	1.02	0.951	1.49	0.145	SW ♀	23	73.1	4.47	0.934	6.12	61.0	83.0	0.965	0.50																																																																																															
Bi-Stenionic	SW ♂	16	71.5	3.20	0.801	4.48	63.0	76.0	0.898	0.05	1.52	0.369	4.48	0.000																																																																																																																																																																																																																																																																																																																																																																																																																																				
	SW ♀	22	67.0	2.59	0.554	3.87	63.0	72.0	0.939	0.10					Opisthion-Inion	SW ♂	18	37.7	4.26	1.005	11.29	30.0	45.0	0.957	0.50	3.10	0.021	0.98*	0.332	SW ♀	23	39.6	7.51	1.566	18.96	31.0	69.0	0.939	0.10	Opisthion-Lambda	SW ♂	18	92.6	3.66	0.864	3.96	87.0	98.0	0.928	0.10	3.83	0.007	1.66*	0.105	SW ♀	23	89.7	7.16	1.495	7.98	66.0	100.0	0.868	0.01	Opisthion-Asterion	SW ♂	18	62.6	3.19	0.754	5.10	57.0	68.0	0.961	0.50	2.68	0.042	0.21*	0.837	SW ♀	23	62.3	5.23	1.092	8.39	46.0	75.0	0.872	<0.01	Opisthion-Glabella	SW ♂	18	143.8	4.88	1.152	3.39	136.0	152.0	0.950	0.10	1.22	0.681	4.09	0.000	SW ♀	21	137.0	5.40	1.179	3.94	128.0	146.0	0.959	0.10	Basion-Asterion	SW ♂	17	75.2	3.72	0.902	4.94	69.0	80.0	0.925	0.02	2.47	0.050	2.06*	0.050	SW ♀	23	73.1	2.36	0.494	2.23	69.0	78.0	0.956	0.10	Basion-Mastoidale	SW ♂	17	53.4	2.55	0.619	4.77	49.0	58.0	0.975	0.50	1.11	0.809	4.52	0.000	SW ♀	23	49.8	2.42	0.506	4.86	45.0	54.0	0.965	0.50	Basion-Staphylion	SW ♂	17	47.8	3.23	0.785	6.76	41.0	53.0	0.967	0.50	2.39	0.059	2.92*	0.007	SW ♀	23	45.2	2.09	0.437	4.62	42.0	50.0	0.961	0.10	Lambda-Bregma	SW ♂	18	114.2	4.68	1.105	4.10	107.0	124.0	0.962	0.50	1.60	0.328	2.07	0.045	SW ♀	23	110.7	5.92	1.236	5.35	98.0	119.0	0.947	0.10	Lambda-Inion	SW ♂	17	66.6	5.53	1.342	8.30	58.0	76.0	0.963	0.50	1.73	0.263	1.85	0.072	SW ♀	23	62.7	7.28	1.518	11.60	39.0	75.0	0.892	0.01	Lambda-Asterion	SW ♂	18	83.1	3.14	0.740	3.78	77.0	89.0	0.979	0.90	1.95	0.163	1.90	0.065	SW ♀	23	80.7	4.39	0.915	5.43	73.0	88.0	0.961	0.10	Auriculare-Zygomaxillary	SW ♂	18	76.8	2.65	0.626	3.45	72.0	80.0	0.873	0.01	1.34	0.545	3.84	0.006	SW ♀	23	73.3	3.07	0.640	4.18	68.0	80.0	0.969	0.50	Auriculare-Opisthion	SW ♂	18	75.2	4.52	1.066	6.00	67.0	82.0	0.895	0.02	1.02	0.951	1.49	0.145	SW ♀	23	73.1	4.47	0.934	6.12	61.0	83.0	0.965	0.50																																																																																																																								
Opisthion-Inion	SW ♂	18	37.7	4.26	1.005	11.29	30.0	45.0	0.957	0.50	3.10	0.021	0.98*	0.332																																																																																																																																																																																																																																																																																																																																																																																																																																				
	SW ♀	23	39.6	7.51	1.566	18.96	31.0	69.0	0.939	0.10					Opisthion-Lambda	SW ♂	18	92.6	3.66	0.864	3.96	87.0	98.0	0.928	0.10	3.83	0.007	1.66*	0.105	SW ♀	23	89.7	7.16	1.495	7.98	66.0	100.0	0.868	0.01	Opisthion-Asterion	SW ♂	18	62.6	3.19	0.754	5.10	57.0	68.0	0.961	0.50	2.68	0.042	0.21*	0.837	SW ♀	23	62.3	5.23	1.092	8.39	46.0	75.0	0.872	<0.01	Opisthion-Glabella	SW ♂	18	143.8	4.88	1.152	3.39	136.0	152.0	0.950	0.10	1.22	0.681	4.09	0.000	SW ♀	21	137.0	5.40	1.179	3.94	128.0	146.0	0.959	0.10	Basion-Asterion	SW ♂	17	75.2	3.72	0.902	4.94	69.0	80.0	0.925	0.02	2.47	0.050	2.06*	0.050	SW ♀	23	73.1	2.36	0.494	2.23	69.0	78.0	0.956	0.10	Basion-Mastoidale	SW ♂	17	53.4	2.55	0.619	4.77	49.0	58.0	0.975	0.50	1.11	0.809	4.52	0.000	SW ♀	23	49.8	2.42	0.506	4.86	45.0	54.0	0.965	0.50	Basion-Staphylion	SW ♂	17	47.8	3.23	0.785	6.76	41.0	53.0	0.967	0.50	2.39	0.059	2.92*	0.007	SW ♀	23	45.2	2.09	0.437	4.62	42.0	50.0	0.961	0.10	Lambda-Bregma	SW ♂	18	114.2	4.68	1.105	4.10	107.0	124.0	0.962	0.50	1.60	0.328	2.07	0.045	SW ♀	23	110.7	5.92	1.236	5.35	98.0	119.0	0.947	0.10	Lambda-Inion	SW ♂	17	66.6	5.53	1.342	8.30	58.0	76.0	0.963	0.50	1.73	0.263	1.85	0.072	SW ♀	23	62.7	7.28	1.518	11.60	39.0	75.0	0.892	0.01	Lambda-Asterion	SW ♂	18	83.1	3.14	0.740	3.78	77.0	89.0	0.979	0.90	1.95	0.163	1.90	0.065	SW ♀	23	80.7	4.39	0.915	5.43	73.0	88.0	0.961	0.10	Auriculare-Zygomaxillary	SW ♂	18	76.8	2.65	0.626	3.45	72.0	80.0	0.873	0.01	1.34	0.545	3.84	0.006	SW ♀	23	73.3	3.07	0.640	4.18	68.0	80.0	0.969	0.50	Auriculare-Opisthion	SW ♂	18	75.2	4.52	1.066	6.00	67.0	82.0	0.895	0.02	1.02	0.951	1.49	0.145	SW ♀	23	73.1	4.47	0.934	6.12	61.0	83.0	0.965	0.50																																																																																																																																																	
Opisthion-Lambda	SW ♂	18	92.6	3.66	0.864	3.96	87.0	98.0	0.928	0.10	3.83	0.007	1.66*	0.105																																																																																																																																																																																																																																																																																																																																																																																																																																				
	SW ♀	23	89.7	7.16	1.495	7.98	66.0	100.0	0.868	0.01					Opisthion-Asterion	SW ♂	18	62.6	3.19	0.754	5.10	57.0	68.0	0.961	0.50	2.68	0.042	0.21*	0.837	SW ♀	23	62.3	5.23	1.092	8.39	46.0	75.0	0.872	<0.01	Opisthion-Glabella	SW ♂	18	143.8	4.88	1.152	3.39	136.0	152.0	0.950	0.10	1.22	0.681	4.09	0.000	SW ♀	21	137.0	5.40	1.179	3.94	128.0	146.0	0.959	0.10	Basion-Asterion	SW ♂	17	75.2	3.72	0.902	4.94	69.0	80.0	0.925	0.02	2.47	0.050	2.06*	0.050	SW ♀	23	73.1	2.36	0.494	2.23	69.0	78.0	0.956	0.10	Basion-Mastoidale	SW ♂	17	53.4	2.55	0.619	4.77	49.0	58.0	0.975	0.50	1.11	0.809	4.52	0.000	SW ♀	23	49.8	2.42	0.506	4.86	45.0	54.0	0.965	0.50	Basion-Staphylion	SW ♂	17	47.8	3.23	0.785	6.76	41.0	53.0	0.967	0.50	2.39	0.059	2.92*	0.007	SW ♀	23	45.2	2.09	0.437	4.62	42.0	50.0	0.961	0.10	Lambda-Bregma	SW ♂	18	114.2	4.68	1.105	4.10	107.0	124.0	0.962	0.50	1.60	0.328	2.07	0.045	SW ♀	23	110.7	5.92	1.236	5.35	98.0	119.0	0.947	0.10	Lambda-Inion	SW ♂	17	66.6	5.53	1.342	8.30	58.0	76.0	0.963	0.50	1.73	0.263	1.85	0.072	SW ♀	23	62.7	7.28	1.518	11.60	39.0	75.0	0.892	0.01	Lambda-Asterion	SW ♂	18	83.1	3.14	0.740	3.78	77.0	89.0	0.979	0.90	1.95	0.163	1.90	0.065	SW ♀	23	80.7	4.39	0.915	5.43	73.0	88.0	0.961	0.10	Auriculare-Zygomaxillary	SW ♂	18	76.8	2.65	0.626	3.45	72.0	80.0	0.873	0.01	1.34	0.545	3.84	0.006	SW ♀	23	73.3	3.07	0.640	4.18	68.0	80.0	0.969	0.50	Auriculare-Opisthion	SW ♂	18	75.2	4.52	1.066	6.00	67.0	82.0	0.895	0.02	1.02	0.951	1.49	0.145	SW ♀	23	73.1	4.47	0.934	6.12	61.0	83.0	0.965	0.50																																																																																																																																																																										
Opisthion-Asterion	SW ♂	18	62.6	3.19	0.754	5.10	57.0	68.0	0.961	0.50	2.68	0.042	0.21*	0.837																																																																																																																																																																																																																																																																																																																																																																																																																																				
	SW ♀	23	62.3	5.23	1.092	8.39	46.0	75.0	0.872	<0.01					Opisthion-Glabella	SW ♂	18	143.8	4.88	1.152	3.39	136.0	152.0	0.950	0.10	1.22	0.681	4.09	0.000	SW ♀	21	137.0	5.40	1.179	3.94	128.0	146.0	0.959	0.10	Basion-Asterion	SW ♂	17	75.2	3.72	0.902	4.94	69.0	80.0	0.925	0.02	2.47	0.050	2.06*	0.050	SW ♀	23	73.1	2.36	0.494	2.23	69.0	78.0	0.956	0.10	Basion-Mastoidale	SW ♂	17	53.4	2.55	0.619	4.77	49.0	58.0	0.975	0.50	1.11	0.809	4.52	0.000	SW ♀	23	49.8	2.42	0.506	4.86	45.0	54.0	0.965	0.50	Basion-Staphylion	SW ♂	17	47.8	3.23	0.785	6.76	41.0	53.0	0.967	0.50	2.39	0.059	2.92*	0.007	SW ♀	23	45.2	2.09	0.437	4.62	42.0	50.0	0.961	0.10	Lambda-Bregma	SW ♂	18	114.2	4.68	1.105	4.10	107.0	124.0	0.962	0.50	1.60	0.328	2.07	0.045	SW ♀	23	110.7	5.92	1.236	5.35	98.0	119.0	0.947	0.10	Lambda-Inion	SW ♂	17	66.6	5.53	1.342	8.30	58.0	76.0	0.963	0.50	1.73	0.263	1.85	0.072	SW ♀	23	62.7	7.28	1.518	11.60	39.0	75.0	0.892	0.01	Lambda-Asterion	SW ♂	18	83.1	3.14	0.740	3.78	77.0	89.0	0.979	0.90	1.95	0.163	1.90	0.065	SW ♀	23	80.7	4.39	0.915	5.43	73.0	88.0	0.961	0.10	Auriculare-Zygomaxillary	SW ♂	18	76.8	2.65	0.626	3.45	72.0	80.0	0.873	0.01	1.34	0.545	3.84	0.006	SW ♀	23	73.3	3.07	0.640	4.18	68.0	80.0	0.969	0.50	Auriculare-Opisthion	SW ♂	18	75.2	4.52	1.066	6.00	67.0	82.0	0.895	0.02	1.02	0.951	1.49	0.145	SW ♀	23	73.1	4.47	0.934	6.12	61.0	83.0	0.965	0.50																																																																																																																																																																																																			
Opisthion-Glabella	SW ♂	18	143.8	4.88	1.152	3.39	136.0	152.0	0.950	0.10	1.22	0.681	4.09	0.000																																																																																																																																																																																																																																																																																																																																																																																																																																				
	SW ♀	21	137.0	5.40	1.179	3.94	128.0	146.0	0.959	0.10					Basion-Asterion	SW ♂	17	75.2	3.72	0.902	4.94	69.0	80.0	0.925	0.02	2.47	0.050	2.06*	0.050	SW ♀	23	73.1	2.36	0.494	2.23	69.0	78.0	0.956	0.10	Basion-Mastoidale	SW ♂	17	53.4	2.55	0.619	4.77	49.0	58.0	0.975	0.50	1.11	0.809	4.52	0.000	SW ♀	23	49.8	2.42	0.506	4.86	45.0	54.0	0.965	0.50	Basion-Staphylion	SW ♂	17	47.8	3.23	0.785	6.76	41.0	53.0	0.967	0.50	2.39	0.059	2.92*	0.007	SW ♀	23	45.2	2.09	0.437	4.62	42.0	50.0	0.961	0.10	Lambda-Bregma	SW ♂	18	114.2	4.68	1.105	4.10	107.0	124.0	0.962	0.50	1.60	0.328	2.07	0.045	SW ♀	23	110.7	5.92	1.236	5.35	98.0	119.0	0.947	0.10	Lambda-Inion	SW ♂	17	66.6	5.53	1.342	8.30	58.0	76.0	0.963	0.50	1.73	0.263	1.85	0.072	SW ♀	23	62.7	7.28	1.518	11.60	39.0	75.0	0.892	0.01	Lambda-Asterion	SW ♂	18	83.1	3.14	0.740	3.78	77.0	89.0	0.979	0.90	1.95	0.163	1.90	0.065	SW ♀	23	80.7	4.39	0.915	5.43	73.0	88.0	0.961	0.10	Auriculare-Zygomaxillary	SW ♂	18	76.8	2.65	0.626	3.45	72.0	80.0	0.873	0.01	1.34	0.545	3.84	0.006	SW ♀	23	73.3	3.07	0.640	4.18	68.0	80.0	0.969	0.50	Auriculare-Opisthion	SW ♂	18	75.2	4.52	1.066	6.00	67.0	82.0	0.895	0.02	1.02	0.951	1.49	0.145	SW ♀	23	73.1	4.47	0.934	6.12	61.0	83.0	0.965	0.50																																																																																																																																																																																																																												
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Basion-Mastoidale	SW ♂	17	53.4	2.55	0.619	4.77	49.0	58.0	0.975	0.50	1.11	0.809	4.52	0.000																																																																																																																																																																																																																																																																																																																																																																																																																																				
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	SW ♀	23	45.2	2.09	0.437	4.62	42.0	50.0	0.961	0.10					Lambda-Bregma	SW ♂	18	114.2	4.68	1.105	4.10	107.0	124.0	0.962	0.50	1.60	0.328	2.07	0.045	SW ♀	23	110.7	5.92	1.236	5.35	98.0	119.0	0.947	0.10	Lambda-Inion	SW ♂	17	66.6	5.53	1.342	8.30	58.0	76.0	0.963	0.50	1.73	0.263	1.85	0.072	SW ♀	23	62.7	7.28	1.518	11.60	39.0	75.0	0.892	0.01	Lambda-Asterion	SW ♂	18	83.1	3.14	0.740	3.78	77.0	89.0	0.979	0.90	1.95	0.163	1.90	0.065	SW ♀	23	80.7	4.39	0.915	5.43	73.0	88.0	0.961	0.10	Auriculare-Zygomaxillary	SW ♂	18	76.8	2.65	0.626	3.45	72.0	80.0	0.873	0.01	1.34	0.545	3.84	0.006	SW ♀	23	73.3	3.07	0.640	4.18	68.0	80.0	0.969	0.50	Auriculare-Opisthion	SW ♂	18	75.2	4.52	1.066	6.00	67.0	82.0	0.895	0.02	1.02	0.951	1.49	0.145	SW ♀	23	73.1	4.47	0.934	6.12	61.0	83.0	0.965	0.50																																																																																																																																																																																																																																																																																																							
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	SW ♀	23	62.7	7.28	1.518	11.60	39.0	75.0	0.892	0.01					Lambda-Asterion	SW ♂	18	83.1	3.14	0.740	3.78	77.0	89.0	0.979	0.90	1.95	0.163	1.90	0.065	SW ♀	23	80.7	4.39	0.915	5.43	73.0	88.0	0.961	0.10	Auriculare-Zygomaxillary	SW ♂	18	76.8	2.65	0.626	3.45	72.0	80.0	0.873	0.01	1.34	0.545	3.84	0.006	SW ♀	23	73.3	3.07	0.640	4.18	68.0	80.0	0.969	0.50	Auriculare-Opisthion	SW ♂	18	75.2	4.52	1.066	6.00	67.0	82.0	0.895	0.02	1.02	0.951	1.49	0.145	SW ♀	23	73.1	4.47	0.934	6.12	61.0	83.0	0.965	0.50																																																																																																																																																																																																																																																																																																																																																									
Lambda-Asterion	SW ♂	18	83.1	3.14	0.740	3.78	77.0	89.0	0.979	0.90	1.95	0.163	1.90	0.065																																																																																																																																																																																																																																																																																																																																																																																																																																				
	SW ♀	23	80.7	4.39	0.915	5.43	73.0	88.0	0.961	0.10					Auriculare-Zygomaxillary	SW ♂	18	76.8	2.65	0.626	3.45	72.0	80.0	0.873	0.01	1.34	0.545	3.84	0.006	SW ♀	23	73.3	3.07	0.640	4.18	68.0	80.0	0.969	0.50	Auriculare-Opisthion	SW ♂	18	75.2	4.52	1.066	6.00	67.0	82.0	0.895	0.02	1.02	0.951	1.49	0.145	SW ♀	23	73.1	4.47	0.934	6.12	61.0	83.0	0.965	0.50																																																																																																																																																																																																																																																																																																																																																																																		
Auriculare-Zygomaxillary	SW ♂	18	76.8	2.65	0.626	3.45	72.0	80.0	0.873	0.01	1.34	0.545	3.84	0.006																																																																																																																																																																																																																																																																																																																																																																																																																																				
	SW ♀	23	73.3	3.07	0.640	4.18	68.0	80.0	0.969	0.50					Auriculare-Opisthion	SW ♂	18	75.2	4.52	1.066	6.00	67.0	82.0	0.895	0.02	1.02	0.951	1.49	0.145	SW ♀	23	73.1	4.47	0.934	6.12	61.0	83.0	0.965	0.50																																																																																																																																																																																																																																																																																																																																																																																																											
Auriculare-Opisthion	SW ♂	18	75.2	4.52	1.066	6.00	67.0	82.0	0.895	0.02	1.02	0.951	1.49	0.145																																																																																																																																																																																																																																																																																																																																																																																																																																				
	SW ♀	23	73.1	4.47	0.934	6.12	61.0	83.0	0.965	0.50																																																																																																																																																																																																																																																																																																																																																																																																																																								

*T calculated using separate variance estimate

		n	\bar{X}	s	SE	CV	Min.	Max.	W	P	F	P	T	P
Auriculare-Basion	SW ♂	17	66.8	6.45	1.565	9.65	60.0	80.0	0.800	<0.01				
	SW ♀	23	62.6	3.05	0.636	4.87	58.0	71.0	0.945	0.10	4.47	0.001	2.48*	0.022
Nasion-Nasospinale	SW ♂	23	51.4	2.25	0.470	4.38	46.0	56.0	0.946	0.10				
	SW ♀	24	47.5	3.43	0.702	7.23	40.0	54.0	0.970	0.50	2.33	0.052	4.66*	0.000
Nasion-Prosthion	SW ♂	22	67.6	2.88	0.616	4.26	62.0	73.0	0.950	0.10				
	SW ♀	24	63.6	4.29	0.876	6.74	56.0	72.0	0.945	0.10	2.21	0.072	3.68	0.001
Nasospinale-Prosthion	SW ♂	22	16.0	2.51	0.536	15.68	12.0	21.0	0.962	0.50				
	SW ♀	24	16.0	1.73	0.353	10.79	13.0	19.0	0.955	0.10	2.11	0.084	0.01	0.995
Nasal breadth	SW ♂	18	26.5	1.46	0.345	5.53	24.0	29.0	0.945	0.10				
	SW ♀	23	25.4	1.19	0.250	4.71	23.0	27.0	0.892	0.01	1.49	0.374	2.56	0.014
Orbital height	SW ♂	23	34.2	2.29	0.479	6.70	31.0	40.0	0.925	0.05				
	SW ♀	25	33.4	1.78	0.356	5.32	31.0	38.0	0.928	0.05	1.66	0.229	1.25	0.218
Orbital breadth	SW ♂	18	43.8	1.29	0.305	2.95	40.0	46.0	0.855	<0.01				
	SW ♀	23	42.1	1.18	0.246	2.80	40.0	45.0	0.928	0.10	1.20	0.672	4.40	0.000
Bi-Ectoconchion	SW ♂	21	103.6	3.46	0.757	3.35	95.0	110.0	0.958	0.10				
	SW ♀	25	99.9	3.36	0.672	3.36	95.0	110.0	0.898	0.01	1.07	0.873	3.67	0.001
Frontal arc	SW ♂	18	128.3	4.73	1.115	0.87	117.0	136.0	0.944	0.10				
	SW ♀	20	122.8	4.94	1.106	4.03	112.0	130.0	0.945	0.10	1.09	0.857	3.55	0.001
Parietal arc	SW ♂	18	126.2	5.67	1.337	4.49	118.0	137.0	0.961	0.50				
	SW ♀	22	123.1	6.79	1.448	5.52	106.0	133.0	0.958	0.10	1.43	0.455	1.54	0.132
Occipital arc	SW ♂	18	113.3	5.95	1.403	5.25	103.0	125.0	0.964	0.50				
	SW ♀	23	111.1	6.11	1.274	5.49	95.0	119.0	0.932	0.10	1.05	0.925	1.14	0.263
Alveolar length	SW ♂	23	61.6	3.29	0.688	5.35	54.0	67.0	0.965	0.50				
	SW ♀	25	57.6	2.02	0.404	3.50	53.0	63.0	0.971	0.50	2.67	0.021	5.02*	0.000
Alveolar breadth	SW ♂	23	66.6	2.77	0.579	4.17	61.0	73.0	0.965	0.50				
	SW ♀	25	62.3	2.85	0.571	4.58	58.0	67.0	0.932	0.10	1.06	0.900	5.27	0.000
Mastoid depth	SW ♂	22	29.2	2.81	0.599	9.61	24.0	36.0	0.901	0.10				
	SW ♀	25	24.8	2.43	0.486	9.80	20.0	28.0	0.925	0.10	1.33	0.492	5.79	0.000
Bi-Canine breadth	SW ♂	15	46.0	1.85	0.478	4.03	43.0	49.0	0.920	0.10				
	SW ♀	23	42.9	2.05	0.429	4.78	40.0	49.0	0.820	<0.01	1.23	0.699	4.63	0.000
Parietal Subtense height	SW ♂	18	22.6	2.72	0.642	12.01	17.0	27.0	0.930	0.10				
	SW ♀	22	22.7	2.46	0.526	10.84	18.0	28.0	0.932	0.10	1.22	0.661	0.13	0.898
Bregma-Parietal subtense	SW ♂	18	59.1	4.13	0.974	6.98	53.0	65.0	0.915	0.10				
	SW ♀	22	58.0	5.07	1.082	8.74	49.0	67.0	0.926	0.10	1.51	0.394	0.75	0.455

*T calculated using separate variance estimate

		n	\bar{X}	s	SE	CV	Min.	Max.	W	P	F	P	T	P
Frontal curvature index	SW ♂	23	22.4	1.88	-	8.39	19.0	26.0	-	-				
	SW ♀	23	24.2	1.70	-	7.02	19.0	27.0	-	-	1.12	0.788	2.46	0.010
Parietal curvature index	SW ♂	18	19.7	2.07	-	10.51	17.0	23.0	-	-				
	SW ♀	22	20.4	1.76	-	8.63	18.0	25.0	-	-	1.10	0.820	1.12	0.250
Gnathic index	SW ♂	20	103.1	3.56		3.45	95.0	108.0	-	-				
	SW ♀	24	104.4	3.71	-	3.55	97.0	112.0	-	-	1.12	0.788	0.83	0.250
Upper facial index	SW ♂	17	49.4	2.66	-	5.38	45.0	54.0	-	-				
	SW ♀	21	50.1	3.-7	-	7.92	42.0	61.0	-	-	1.79	0.166	0.60	0.500
Palate module	SW ♂	23	41.0	2.88	-	7.03	35.0	46.0	-	-				
	SW ♀	25	35.9	2.38	-	6.63	31.0	40.0	-	-	1.35	0.477	6.61	0.000

Table 49
Descriptive statistics for the Broadbeach male and female crania (mm.)

		n	\bar{X}	s	SE	CV	Min.	Max.	W	P	F	P	T	P
Maximum Bi-Parietal breadth	BB ♂	15	131.5	4.51	1.166	3.43	124.0	142.0	0.959	0.50				
	BB ♀	3	123.3	2.51	1.453	3.01	177.0	198.0	-	-	3.22	0.524	3.00	0.008
Glabella-Opisthocranion	BB ♂	14	192.5	4.95	1.325	2.57	186.0	201.0	0.942	0.10				
	BB ♀	3	185.3	4.93	2.848	2.66	182.0	191.0	-	-	1.01	1.000	2.27	0.038
Glabella-Lambda	BB ♂	14	187.0	5.63	1.506	3.01	177.0	198.0	0.976	0.90				
	BB ♀	3	179.3	3.21	1.856	1.79	177.0	183.0	-	-	3.07	0.544	2.26	0.039
Nasion-Bregma	BB ♂	14	138.5	5.44	1.455	3.93	130.0	149.0	0.955	0.50				
	BB ♀	3	130.6	2.51	1.453	1.93	128.0	133.0	-	-	4.68	0.379	2.41	0.029
Nasion-Nasion	BB ♂	13	104.6	3.25	0.903	3.16	98.0	110.0	0.921	0.10				
	BB ♀	3	99.6	3.51	2.028	3.52	96.0	103.0	-	-	1.16	0.690	2.35	0.034
Nasion-Nasospinale	BB ♂	11	97.1	3.31	0.998	3.41	91.0	101.0	0.891	0.10				
	BB ♀	3	96.3	4.61	2.660	4.79	91.0	99.0	-	-	1.95	0.387	0.37	0.721
Nasion-Prosthion	BB ♂	11	103.7	5.40	1.630	5.21	93.0	109.0	0.794	0.01				
	BB ♀	3	103.3	3.78	2.186	3.66	99.0	106.0	-	-	2.04	0.747	0.12	0.909
Bi-Sphenion	BB ♂	9	103.5	3.08	1.029	2.98	100.0	110.0	0.902	0.10				
	BB ♀	3	101.0	4.58	2.646	4.54	97.0	106.0	-	-	2.20	0.346	1.11	0.291
Glabella-Bregma	BB ♂	15	113.8	5.63	1.454	4.94	107.0	129.0	0.900	0.05				
	BB ♀	3	105.6	1.15	0.667	1.09	105.0	107.0	-	-	23.77	0.082	2.45	0.026
Nasion-Bregma	BB ♂	16	117.5	5.07	1.268	4.32	110.0	131.0	0.928	0.10				
	BB ♀	3	110.6	2.08	1.202	1.88	109.0	113.0	-	-	5.94	0.307	2.25	0.038
Metopion height	BB ♂	16	28.0	2.98	0.747	10.67	20.0	33.0	0.898	0.05				
	BB ♀	3	28.0	1.73	1.000	6.18	27.0	30.0	-	-	2.98	0.560	0.00	1.000
Nasion-Metopion	BB ♂	16	52.6	3.34	0.835	6.34	49.0	59.0	0.902	0.05				
	BB ♀	3	49.0	5.56	3.215	11.36	44.0	55.0	0.902	0.10	2.78	0.188	1.60	0.129
Max. Supraorbital breadth	BB ♂	11	113.2	4.24	1.280	3.74	104.0	120.0	0.952	0.50				
	BB ♀	3	106.0	1.73	1.000	1.63	105.0	108.0	-	-	6.01	0.302	2.83	0.015
Max. Posterior Frontal br.	BB ♂	4	117.7	1.70	0.854	1.45	116.0	120.0	0.971	0.50				
	BB ♀	1	108.0	-	-	-	108.0	108.0	-	-	-	-	-	-
Min. Postorbital breadth	BB ♂	14	100.3	5.55	1.485	5.53	92.0	110.0	0.926	0.10				
	BB ♀	3	95.6	2.51	1.453	2.63	93.0	98.0	-	-	4.87	0.366	1.40	0.181
Bi-Zygion	BB ♂	3	141.6	1.15	0.667	0.81	141.0	143.0	0.750	<0.01				
	BB ♀	1	124.0	-	-	-	124.0	124.0	-	-	-	-	-	-
Bi-Zygomaxillary	BB ♂	5	101.8	4.60	2.059	4.52	97.0	109.0	0.943	0.50				
	BB ♀	1	97.0	-	-	-	97.0	97.0	-	-	-	-	-	-
Nasion-Nasospinale	BB ♂	12	50.2	3.98	1.149	7.92	45.0	56.0	0.915	0.10				
	BB ♀	3	48.3	3.51	2.028	7.26	45.0	52.0	-	-	1.28	1.000	0.76	0.461

		n	\bar{X}	s	SE	CV	Min.	Max.	W	P	F	P	T	P
asion-Prosthion	BB ♂	13	64.2	6.12	1.699	9.54	51.0	74.0	0.974	0.90				
	BB ♀	3	63.0	2.64	1.528	4.20	60.0	65.0	-	-	5.36	0.336	0.33	0.744
asospinale-Prosthion	BB ♂	12	16.1	3.32	0.960	20.57	12.0	23.0	0.939	0.10				
	BB ♀	3	16.3	2.08	1.202	12.75	14.0	18.0	-	-	2.55	0.630	0.08	0.936
rbital height	BB ♂	9	35.0	1.80	0.601	5.15	32.0	37.0	0.896	0.10				
	BB ♀	2	34.0	2.82	2.000	8.32	32.0	36.0	-	-	2.46	0.311	0.66	0.527
i-Ectoconchion	BB ♂	5	108.4	3.64	1.631	3.36	104.0	114.0	0.955	0.50				
	BB ♀	3	101.6	1.52	0.882	1.50	100.0	103.0	-	-	5.70	0.310	2.97	0.025
lveolar length	BB ♂	15	61.1	3.18	0.822	5.21	56.0	67.0	0.972	0.50				
	BB ♀	3	60.3	2.08	1.202	3.45	58.0	62.0	-	-	2.34	0.680	0.41	0.685
lveolar breadth	BB ♂	14	67.7	3.83	1.024	5.66	56.0	73.0	0.728	<0.01				
	BB ♀	3	63.3	4.04	2.333	6.38	61.0	68.0	-	-	1.11	0.716	1.78	0.095
lastoid depth	BB ♂	14	30.2	2.29	0.613	7.59	26.0	33.0	0.922	0.10				
	BB ♀	2	27.0	4.24	3.000	15.71	24.0	30.0	-	-	-	-	-	-
rontal curvature index	BB ♂	16	23.8	2.34	-	9.83	18.0	28.0	-	-				
	BB ♀	3	25.2	1.76	-	3.10	24.0	27.0	-	-	2.46	0.311	0.93	0.250
nathic index	BB ♂	11	98.7	4.58	-	4.64	90.0	105.0	-	-				
	BB ♀	3	103.6	2.11	-	4.44	102.0	106.0			3.22	0.524	1.66	0.100
pper Facial index	BB ♂	3	48.2	3.27	-	6.78	45.0	52.0	-	-				
	BB ♀	1	52.4	-	-	-	52.0	52.0	-	-	-	-	-	-
Palate module	BB ♂	13	41.3	3.50	-	8.47	35.0	48.0	-	-				
	BB ♀	3	38.2	3.07	-	8.04	35.0	41.0	-	-	1.28	1.000	1.32	0.200

Table 50

Comparative statistics for the Murray Valley (MV) and Coobool Creek (CC) male crania (mm.)

		n	\bar{X}	s	CV	F	P	T	P																																																																																																																																																																																																																																																																																								
Max. Bi-Parietal breadth	MV	46	130.5	4.52	3.46	1.29	0.595	6.08	0.000																																																																																																																																																																																																																																																																																								
	CC	17	138.1	3.98	2.82					Glabella-Opisthocranion	MV	47	189.1	5.75	3.04	1.01	0.929	4.34	0.000	CC	17	196.2	5.78	2.95	Glabella-Lambda	MV	47	184.2	5.75	3.20	1.46	0.313	4.95	0.000	CC	17	192.8	6.95	3.61	Basion-Bregma	MV	45	133.4	4.04	3.03	1.63	0.204	7.21	0.000	CC	17	142.4	5.16	3.62	Basion-Nasion	MV	45	102.4	3.28	3.21	1.13	0.721	2.39	0.020	CC	17	104.7	3.49	3.33	Basion-Nasospinale	MV	45	99.0	3.88	3.92	1.23	0.709	2.89	0.005	CC	14	102.3	3.50	3.42	Basion-Prosthion	MV	45	106.5	4.37	4.11	1.15	0.833	2.44	0.018	CC	13	109.8	4.07	3.71	Basion-Lambda	MV	45	114.2	2.83	2.48	5.40	0.000	5.88*	0.000	CC	17	123.9	6.59	5.32	Basion-Inion	MV	43	81.5	4.93	6.05	1.11	0.860	2.18	0.033	CC	17	78.4	4.69	5.98	Bi-Auriculare	MV	47	121.2	4.23	3.49	1.87	0.186	4.45	0.000	CC	16	126.4	3.09	2.45	Bi-Asterion	MV	44	111.4	3.84	3.45	1.15	0.683	0.58	0.562	CC	17	110.8	4.12	3.72	Bi-Sphenion	MV	45	103.6	3.77	3.64	1.99	0.084	3.67	0.001	CC	15	108.2	5.32	1.37	Glabella-Bregma	MV	47	109.9	4.38	3.99	1.41	0.357	5.96	0.000	CC	17	117.7	5.20	4.42	Nasion-Bregma	MV	47	113.4	4.28	3.77	1.50	0.280	5.80	0.000	CC	17	120.9	5.25	4.34	Metopion height	MV	47	25.6	2.20	8.61	2.73	0.008	3.46	0.001	CC	17	23.0	3.64	15.82	Nasion-Metopion	MV	47	51.0	3.34	6.56	2.52	0.015	2.54	0.014	CC	17	53.8	5.31	9.86	Max. Supraorbital br.	MV	47	108.5	3.48	3.20	1.41	0.364	7.02	0.000	CC	16	115.9	4.13	3.57	Max. Posterior Frontal br.	MV	16	110.7	3.13	2.83	-	-	-	-	CC	1	110.0	-	-	Min. Postorbital br.	MV	47	95.4	4.60	4.82	1.77	0.134	2.54	0.013	CC	17	99.1	6.12	6.18	Min. Bi-Temporal lines	MV	47	87.0	7.83	9.00	1.07	0.812	3.47	0.001
Glabella-Opisthocranion	MV	47	189.1	5.75	3.04	1.01	0.929	4.34	0.000																																																																																																																																																																																																																																																																																								
	CC	17	196.2	5.78	2.95					Glabella-Lambda	MV	47	184.2	5.75	3.20	1.46	0.313	4.95	0.000	CC	17	192.8	6.95	3.61	Basion-Bregma	MV	45	133.4	4.04	3.03	1.63	0.204	7.21	0.000	CC	17	142.4	5.16	3.62	Basion-Nasion	MV	45	102.4	3.28	3.21	1.13	0.721	2.39	0.020	CC	17	104.7	3.49	3.33	Basion-Nasospinale	MV	45	99.0	3.88	3.92	1.23	0.709	2.89	0.005	CC	14	102.3	3.50	3.42	Basion-Prosthion	MV	45	106.5	4.37	4.11	1.15	0.833	2.44	0.018	CC	13	109.8	4.07	3.71	Basion-Lambda	MV	45	114.2	2.83	2.48	5.40	0.000	5.88*	0.000	CC	17	123.9	6.59	5.32	Basion-Inion	MV	43	81.5	4.93	6.05	1.11	0.860	2.18	0.033	CC	17	78.4	4.69	5.98	Bi-Auriculare	MV	47	121.2	4.23	3.49	1.87	0.186	4.45	0.000	CC	16	126.4	3.09	2.45	Bi-Asterion	MV	44	111.4	3.84	3.45	1.15	0.683	0.58	0.562	CC	17	110.8	4.12	3.72	Bi-Sphenion	MV	45	103.6	3.77	3.64	1.99	0.084	3.67	0.001	CC	15	108.2	5.32	1.37	Glabella-Bregma	MV	47	109.9	4.38	3.99	1.41	0.357	5.96	0.000	CC	17	117.7	5.20	4.42	Nasion-Bregma	MV	47	113.4	4.28	3.77	1.50	0.280	5.80	0.000	CC	17	120.9	5.25	4.34	Metopion height	MV	47	25.6	2.20	8.61	2.73	0.008	3.46	0.001	CC	17	23.0	3.64	15.82	Nasion-Metopion	MV	47	51.0	3.34	6.56	2.52	0.015	2.54	0.014	CC	17	53.8	5.31	9.86	Max. Supraorbital br.	MV	47	108.5	3.48	3.20	1.41	0.364	7.02	0.000	CC	16	115.9	4.13	3.57	Max. Posterior Frontal br.	MV	16	110.7	3.13	2.83	-	-	-	-	CC	1	110.0	-	-	Min. Postorbital br.	MV	47	95.4	4.60	4.82	1.77	0.134	2.54	0.013	CC	17	99.1	6.12	6.18	Min. Bi-Temporal lines	MV	47	87.0	7.83	9.00	1.07	0.812	3.47	0.001	CC	17	94.7	8.12	8.57										
Glabella-Lambda	MV	47	184.2	5.75	3.20	1.46	0.313	4.95	0.000																																																																																																																																																																																																																																																																																								
	CC	17	192.8	6.95	3.61					Basion-Bregma	MV	45	133.4	4.04	3.03	1.63	0.204	7.21	0.000	CC	17	142.4	5.16	3.62	Basion-Nasion	MV	45	102.4	3.28	3.21	1.13	0.721	2.39	0.020	CC	17	104.7	3.49	3.33	Basion-Nasospinale	MV	45	99.0	3.88	3.92	1.23	0.709	2.89	0.005	CC	14	102.3	3.50	3.42	Basion-Prosthion	MV	45	106.5	4.37	4.11	1.15	0.833	2.44	0.018	CC	13	109.8	4.07	3.71	Basion-Lambda	MV	45	114.2	2.83	2.48	5.40	0.000	5.88*	0.000	CC	17	123.9	6.59	5.32	Basion-Inion	MV	43	81.5	4.93	6.05	1.11	0.860	2.18	0.033	CC	17	78.4	4.69	5.98	Bi-Auriculare	MV	47	121.2	4.23	3.49	1.87	0.186	4.45	0.000	CC	16	126.4	3.09	2.45	Bi-Asterion	MV	44	111.4	3.84	3.45	1.15	0.683	0.58	0.562	CC	17	110.8	4.12	3.72	Bi-Sphenion	MV	45	103.6	3.77	3.64	1.99	0.084	3.67	0.001	CC	15	108.2	5.32	1.37	Glabella-Bregma	MV	47	109.9	4.38	3.99	1.41	0.357	5.96	0.000	CC	17	117.7	5.20	4.42	Nasion-Bregma	MV	47	113.4	4.28	3.77	1.50	0.280	5.80	0.000	CC	17	120.9	5.25	4.34	Metopion height	MV	47	25.6	2.20	8.61	2.73	0.008	3.46	0.001	CC	17	23.0	3.64	15.82	Nasion-Metopion	MV	47	51.0	3.34	6.56	2.52	0.015	2.54	0.014	CC	17	53.8	5.31	9.86	Max. Supraorbital br.	MV	47	108.5	3.48	3.20	1.41	0.364	7.02	0.000	CC	16	115.9	4.13	3.57	Max. Posterior Frontal br.	MV	16	110.7	3.13	2.83	-	-	-	-	CC	1	110.0	-	-	Min. Postorbital br.	MV	47	95.4	4.60	4.82	1.77	0.134	2.54	0.013	CC	17	99.1	6.12	6.18	Min. Bi-Temporal lines	MV	47	87.0	7.83	9.00	1.07	0.812	3.47	0.001	CC	17	94.7	8.12	8.57																									
Basion-Bregma	MV	45	133.4	4.04	3.03	1.63	0.204	7.21	0.000																																																																																																																																																																																																																																																																																								
	CC	17	142.4	5.16	3.62					Basion-Nasion	MV	45	102.4	3.28	3.21	1.13	0.721	2.39	0.020	CC	17	104.7	3.49	3.33	Basion-Nasospinale	MV	45	99.0	3.88	3.92	1.23	0.709	2.89	0.005	CC	14	102.3	3.50	3.42	Basion-Prosthion	MV	45	106.5	4.37	4.11	1.15	0.833	2.44	0.018	CC	13	109.8	4.07	3.71	Basion-Lambda	MV	45	114.2	2.83	2.48	5.40	0.000	5.88*	0.000	CC	17	123.9	6.59	5.32	Basion-Inion	MV	43	81.5	4.93	6.05	1.11	0.860	2.18	0.033	CC	17	78.4	4.69	5.98	Bi-Auriculare	MV	47	121.2	4.23	3.49	1.87	0.186	4.45	0.000	CC	16	126.4	3.09	2.45	Bi-Asterion	MV	44	111.4	3.84	3.45	1.15	0.683	0.58	0.562	CC	17	110.8	4.12	3.72	Bi-Sphenion	MV	45	103.6	3.77	3.64	1.99	0.084	3.67	0.001	CC	15	108.2	5.32	1.37	Glabella-Bregma	MV	47	109.9	4.38	3.99	1.41	0.357	5.96	0.000	CC	17	117.7	5.20	4.42	Nasion-Bregma	MV	47	113.4	4.28	3.77	1.50	0.280	5.80	0.000	CC	17	120.9	5.25	4.34	Metopion height	MV	47	25.6	2.20	8.61	2.73	0.008	3.46	0.001	CC	17	23.0	3.64	15.82	Nasion-Metopion	MV	47	51.0	3.34	6.56	2.52	0.015	2.54	0.014	CC	17	53.8	5.31	9.86	Max. Supraorbital br.	MV	47	108.5	3.48	3.20	1.41	0.364	7.02	0.000	CC	16	115.9	4.13	3.57	Max. Posterior Frontal br.	MV	16	110.7	3.13	2.83	-	-	-	-	CC	1	110.0	-	-	Min. Postorbital br.	MV	47	95.4	4.60	4.82	1.77	0.134	2.54	0.013	CC	17	99.1	6.12	6.18	Min. Bi-Temporal lines	MV	47	87.0	7.83	9.00	1.07	0.812	3.47	0.001	CC	17	94.7	8.12	8.57																																								
Basion-Nasion	MV	45	102.4	3.28	3.21	1.13	0.721	2.39	0.020																																																																																																																																																																																																																																																																																								
	CC	17	104.7	3.49	3.33					Basion-Nasospinale	MV	45	99.0	3.88	3.92	1.23	0.709	2.89	0.005	CC	14	102.3	3.50	3.42	Basion-Prosthion	MV	45	106.5	4.37	4.11	1.15	0.833	2.44	0.018	CC	13	109.8	4.07	3.71	Basion-Lambda	MV	45	114.2	2.83	2.48	5.40	0.000	5.88*	0.000	CC	17	123.9	6.59	5.32	Basion-Inion	MV	43	81.5	4.93	6.05	1.11	0.860	2.18	0.033	CC	17	78.4	4.69	5.98	Bi-Auriculare	MV	47	121.2	4.23	3.49	1.87	0.186	4.45	0.000	CC	16	126.4	3.09	2.45	Bi-Asterion	MV	44	111.4	3.84	3.45	1.15	0.683	0.58	0.562	CC	17	110.8	4.12	3.72	Bi-Sphenion	MV	45	103.6	3.77	3.64	1.99	0.084	3.67	0.001	CC	15	108.2	5.32	1.37	Glabella-Bregma	MV	47	109.9	4.38	3.99	1.41	0.357	5.96	0.000	CC	17	117.7	5.20	4.42	Nasion-Bregma	MV	47	113.4	4.28	3.77	1.50	0.280	5.80	0.000	CC	17	120.9	5.25	4.34	Metopion height	MV	47	25.6	2.20	8.61	2.73	0.008	3.46	0.001	CC	17	23.0	3.64	15.82	Nasion-Metopion	MV	47	51.0	3.34	6.56	2.52	0.015	2.54	0.014	CC	17	53.8	5.31	9.86	Max. Supraorbital br.	MV	47	108.5	3.48	3.20	1.41	0.364	7.02	0.000	CC	16	115.9	4.13	3.57	Max. Posterior Frontal br.	MV	16	110.7	3.13	2.83	-	-	-	-	CC	1	110.0	-	-	Min. Postorbital br.	MV	47	95.4	4.60	4.82	1.77	0.134	2.54	0.013	CC	17	99.1	6.12	6.18	Min. Bi-Temporal lines	MV	47	87.0	7.83	9.00	1.07	0.812	3.47	0.001	CC	17	94.7	8.12	8.57																																																							
Basion-Nasospinale	MV	45	99.0	3.88	3.92	1.23	0.709	2.89	0.005																																																																																																																																																																																																																																																																																								
	CC	14	102.3	3.50	3.42					Basion-Prosthion	MV	45	106.5	4.37	4.11	1.15	0.833	2.44	0.018	CC	13	109.8	4.07	3.71	Basion-Lambda	MV	45	114.2	2.83	2.48	5.40	0.000	5.88*	0.000	CC	17	123.9	6.59	5.32	Basion-Inion	MV	43	81.5	4.93	6.05	1.11	0.860	2.18	0.033	CC	17	78.4	4.69	5.98	Bi-Auriculare	MV	47	121.2	4.23	3.49	1.87	0.186	4.45	0.000	CC	16	126.4	3.09	2.45	Bi-Asterion	MV	44	111.4	3.84	3.45	1.15	0.683	0.58	0.562	CC	17	110.8	4.12	3.72	Bi-Sphenion	MV	45	103.6	3.77	3.64	1.99	0.084	3.67	0.001	CC	15	108.2	5.32	1.37	Glabella-Bregma	MV	47	109.9	4.38	3.99	1.41	0.357	5.96	0.000	CC	17	117.7	5.20	4.42	Nasion-Bregma	MV	47	113.4	4.28	3.77	1.50	0.280	5.80	0.000	CC	17	120.9	5.25	4.34	Metopion height	MV	47	25.6	2.20	8.61	2.73	0.008	3.46	0.001	CC	17	23.0	3.64	15.82	Nasion-Metopion	MV	47	51.0	3.34	6.56	2.52	0.015	2.54	0.014	CC	17	53.8	5.31	9.86	Max. Supraorbital br.	MV	47	108.5	3.48	3.20	1.41	0.364	7.02	0.000	CC	16	115.9	4.13	3.57	Max. Posterior Frontal br.	MV	16	110.7	3.13	2.83	-	-	-	-	CC	1	110.0	-	-	Min. Postorbital br.	MV	47	95.4	4.60	4.82	1.77	0.134	2.54	0.013	CC	17	99.1	6.12	6.18	Min. Bi-Temporal lines	MV	47	87.0	7.83	9.00	1.07	0.812	3.47	0.001	CC	17	94.7	8.12	8.57																																																																						
Basion-Prosthion	MV	45	106.5	4.37	4.11	1.15	0.833	2.44	0.018																																																																																																																																																																																																																																																																																								
	CC	13	109.8	4.07	3.71					Basion-Lambda	MV	45	114.2	2.83	2.48	5.40	0.000	5.88*	0.000	CC	17	123.9	6.59	5.32	Basion-Inion	MV	43	81.5	4.93	6.05	1.11	0.860	2.18	0.033	CC	17	78.4	4.69	5.98	Bi-Auriculare	MV	47	121.2	4.23	3.49	1.87	0.186	4.45	0.000	CC	16	126.4	3.09	2.45	Bi-Asterion	MV	44	111.4	3.84	3.45	1.15	0.683	0.58	0.562	CC	17	110.8	4.12	3.72	Bi-Sphenion	MV	45	103.6	3.77	3.64	1.99	0.084	3.67	0.001	CC	15	108.2	5.32	1.37	Glabella-Bregma	MV	47	109.9	4.38	3.99	1.41	0.357	5.96	0.000	CC	17	117.7	5.20	4.42	Nasion-Bregma	MV	47	113.4	4.28	3.77	1.50	0.280	5.80	0.000	CC	17	120.9	5.25	4.34	Metopion height	MV	47	25.6	2.20	8.61	2.73	0.008	3.46	0.001	CC	17	23.0	3.64	15.82	Nasion-Metopion	MV	47	51.0	3.34	6.56	2.52	0.015	2.54	0.014	CC	17	53.8	5.31	9.86	Max. Supraorbital br.	MV	47	108.5	3.48	3.20	1.41	0.364	7.02	0.000	CC	16	115.9	4.13	3.57	Max. Posterior Frontal br.	MV	16	110.7	3.13	2.83	-	-	-	-	CC	1	110.0	-	-	Min. Postorbital br.	MV	47	95.4	4.60	4.82	1.77	0.134	2.54	0.013	CC	17	99.1	6.12	6.18	Min. Bi-Temporal lines	MV	47	87.0	7.83	9.00	1.07	0.812	3.47	0.001	CC	17	94.7	8.12	8.57																																																																																					
Basion-Lambda	MV	45	114.2	2.83	2.48	5.40	0.000	5.88*	0.000																																																																																																																																																																																																																																																																																								
	CC	17	123.9	6.59	5.32					Basion-Inion	MV	43	81.5	4.93	6.05	1.11	0.860	2.18	0.033	CC	17	78.4	4.69	5.98	Bi-Auriculare	MV	47	121.2	4.23	3.49	1.87	0.186	4.45	0.000	CC	16	126.4	3.09	2.45	Bi-Asterion	MV	44	111.4	3.84	3.45	1.15	0.683	0.58	0.562	CC	17	110.8	4.12	3.72	Bi-Sphenion	MV	45	103.6	3.77	3.64	1.99	0.084	3.67	0.001	CC	15	108.2	5.32	1.37	Glabella-Bregma	MV	47	109.9	4.38	3.99	1.41	0.357	5.96	0.000	CC	17	117.7	5.20	4.42	Nasion-Bregma	MV	47	113.4	4.28	3.77	1.50	0.280	5.80	0.000	CC	17	120.9	5.25	4.34	Metopion height	MV	47	25.6	2.20	8.61	2.73	0.008	3.46	0.001	CC	17	23.0	3.64	15.82	Nasion-Metopion	MV	47	51.0	3.34	6.56	2.52	0.015	2.54	0.014	CC	17	53.8	5.31	9.86	Max. Supraorbital br.	MV	47	108.5	3.48	3.20	1.41	0.364	7.02	0.000	CC	16	115.9	4.13	3.57	Max. Posterior Frontal br.	MV	16	110.7	3.13	2.83	-	-	-	-	CC	1	110.0	-	-	Min. Postorbital br.	MV	47	95.4	4.60	4.82	1.77	0.134	2.54	0.013	CC	17	99.1	6.12	6.18	Min. Bi-Temporal lines	MV	47	87.0	7.83	9.00	1.07	0.812	3.47	0.001	CC	17	94.7	8.12	8.57																																																																																																				
Basion-Inion	MV	43	81.5	4.93	6.05	1.11	0.860	2.18	0.033																																																																																																																																																																																																																																																																																								
	CC	17	78.4	4.69	5.98					Bi-Auriculare	MV	47	121.2	4.23	3.49	1.87	0.186	4.45	0.000	CC	16	126.4	3.09	2.45	Bi-Asterion	MV	44	111.4	3.84	3.45	1.15	0.683	0.58	0.562	CC	17	110.8	4.12	3.72	Bi-Sphenion	MV	45	103.6	3.77	3.64	1.99	0.084	3.67	0.001	CC	15	108.2	5.32	1.37	Glabella-Bregma	MV	47	109.9	4.38	3.99	1.41	0.357	5.96	0.000	CC	17	117.7	5.20	4.42	Nasion-Bregma	MV	47	113.4	4.28	3.77	1.50	0.280	5.80	0.000	CC	17	120.9	5.25	4.34	Metopion height	MV	47	25.6	2.20	8.61	2.73	0.008	3.46	0.001	CC	17	23.0	3.64	15.82	Nasion-Metopion	MV	47	51.0	3.34	6.56	2.52	0.015	2.54	0.014	CC	17	53.8	5.31	9.86	Max. Supraorbital br.	MV	47	108.5	3.48	3.20	1.41	0.364	7.02	0.000	CC	16	115.9	4.13	3.57	Max. Posterior Frontal br.	MV	16	110.7	3.13	2.83	-	-	-	-	CC	1	110.0	-	-	Min. Postorbital br.	MV	47	95.4	4.60	4.82	1.77	0.134	2.54	0.013	CC	17	99.1	6.12	6.18	Min. Bi-Temporal lines	MV	47	87.0	7.83	9.00	1.07	0.812	3.47	0.001	CC	17	94.7	8.12	8.57																																																																																																																			
Bi-Auriculare	MV	47	121.2	4.23	3.49	1.87	0.186	4.45	0.000																																																																																																																																																																																																																																																																																								
	CC	16	126.4	3.09	2.45					Bi-Asterion	MV	44	111.4	3.84	3.45	1.15	0.683	0.58	0.562	CC	17	110.8	4.12	3.72	Bi-Sphenion	MV	45	103.6	3.77	3.64	1.99	0.084	3.67	0.001	CC	15	108.2	5.32	1.37	Glabella-Bregma	MV	47	109.9	4.38	3.99	1.41	0.357	5.96	0.000	CC	17	117.7	5.20	4.42	Nasion-Bregma	MV	47	113.4	4.28	3.77	1.50	0.280	5.80	0.000	CC	17	120.9	5.25	4.34	Metopion height	MV	47	25.6	2.20	8.61	2.73	0.008	3.46	0.001	CC	17	23.0	3.64	15.82	Nasion-Metopion	MV	47	51.0	3.34	6.56	2.52	0.015	2.54	0.014	CC	17	53.8	5.31	9.86	Max. Supraorbital br.	MV	47	108.5	3.48	3.20	1.41	0.364	7.02	0.000	CC	16	115.9	4.13	3.57	Max. Posterior Frontal br.	MV	16	110.7	3.13	2.83	-	-	-	-	CC	1	110.0	-	-	Min. Postorbital br.	MV	47	95.4	4.60	4.82	1.77	0.134	2.54	0.013	CC	17	99.1	6.12	6.18	Min. Bi-Temporal lines	MV	47	87.0	7.83	9.00	1.07	0.812	3.47	0.001	CC	17	94.7	8.12	8.57																																																																																																																																		
Bi-Asterion	MV	44	111.4	3.84	3.45	1.15	0.683	0.58	0.562																																																																																																																																																																																																																																																																																								
	CC	17	110.8	4.12	3.72					Bi-Sphenion	MV	45	103.6	3.77	3.64	1.99	0.084	3.67	0.001	CC	15	108.2	5.32	1.37	Glabella-Bregma	MV	47	109.9	4.38	3.99	1.41	0.357	5.96	0.000	CC	17	117.7	5.20	4.42	Nasion-Bregma	MV	47	113.4	4.28	3.77	1.50	0.280	5.80	0.000	CC	17	120.9	5.25	4.34	Metopion height	MV	47	25.6	2.20	8.61	2.73	0.008	3.46	0.001	CC	17	23.0	3.64	15.82	Nasion-Metopion	MV	47	51.0	3.34	6.56	2.52	0.015	2.54	0.014	CC	17	53.8	5.31	9.86	Max. Supraorbital br.	MV	47	108.5	3.48	3.20	1.41	0.364	7.02	0.000	CC	16	115.9	4.13	3.57	Max. Posterior Frontal br.	MV	16	110.7	3.13	2.83	-	-	-	-	CC	1	110.0	-	-	Min. Postorbital br.	MV	47	95.4	4.60	4.82	1.77	0.134	2.54	0.013	CC	17	99.1	6.12	6.18	Min. Bi-Temporal lines	MV	47	87.0	7.83	9.00	1.07	0.812	3.47	0.001	CC	17	94.7	8.12	8.57																																																																																																																																																	
Bi-Sphenion	MV	45	103.6	3.77	3.64	1.99	0.084	3.67	0.001																																																																																																																																																																																																																																																																																								
	CC	15	108.2	5.32	1.37					Glabella-Bregma	MV	47	109.9	4.38	3.99	1.41	0.357	5.96	0.000	CC	17	117.7	5.20	4.42	Nasion-Bregma	MV	47	113.4	4.28	3.77	1.50	0.280	5.80	0.000	CC	17	120.9	5.25	4.34	Metopion height	MV	47	25.6	2.20	8.61	2.73	0.008	3.46	0.001	CC	17	23.0	3.64	15.82	Nasion-Metopion	MV	47	51.0	3.34	6.56	2.52	0.015	2.54	0.014	CC	17	53.8	5.31	9.86	Max. Supraorbital br.	MV	47	108.5	3.48	3.20	1.41	0.364	7.02	0.000	CC	16	115.9	4.13	3.57	Max. Posterior Frontal br.	MV	16	110.7	3.13	2.83	-	-	-	-	CC	1	110.0	-	-	Min. Postorbital br.	MV	47	95.4	4.60	4.82	1.77	0.134	2.54	0.013	CC	17	99.1	6.12	6.18	Min. Bi-Temporal lines	MV	47	87.0	7.83	9.00	1.07	0.812	3.47	0.001	CC	17	94.7	8.12	8.57																																																																																																																																																																
Glabella-Bregma	MV	47	109.9	4.38	3.99	1.41	0.357	5.96	0.000																																																																																																																																																																																																																																																																																								
	CC	17	117.7	5.20	4.42					Nasion-Bregma	MV	47	113.4	4.28	3.77	1.50	0.280	5.80	0.000	CC	17	120.9	5.25	4.34	Metopion height	MV	47	25.6	2.20	8.61	2.73	0.008	3.46	0.001	CC	17	23.0	3.64	15.82	Nasion-Metopion	MV	47	51.0	3.34	6.56	2.52	0.015	2.54	0.014	CC	17	53.8	5.31	9.86	Max. Supraorbital br.	MV	47	108.5	3.48	3.20	1.41	0.364	7.02	0.000	CC	16	115.9	4.13	3.57	Max. Posterior Frontal br.	MV	16	110.7	3.13	2.83	-	-	-	-	CC	1	110.0	-	-	Min. Postorbital br.	MV	47	95.4	4.60	4.82	1.77	0.134	2.54	0.013	CC	17	99.1	6.12	6.18	Min. Bi-Temporal lines	MV	47	87.0	7.83	9.00	1.07	0.812	3.47	0.001	CC	17	94.7	8.12	8.57																																																																																																																																																																															
Nasion-Bregma	MV	47	113.4	4.28	3.77	1.50	0.280	5.80	0.000																																																																																																																																																																																																																																																																																								
	CC	17	120.9	5.25	4.34					Metopion height	MV	47	25.6	2.20	8.61	2.73	0.008	3.46	0.001	CC	17	23.0	3.64	15.82	Nasion-Metopion	MV	47	51.0	3.34	6.56	2.52	0.015	2.54	0.014	CC	17	53.8	5.31	9.86	Max. Supraorbital br.	MV	47	108.5	3.48	3.20	1.41	0.364	7.02	0.000	CC	16	115.9	4.13	3.57	Max. Posterior Frontal br.	MV	16	110.7	3.13	2.83	-	-	-	-	CC	1	110.0	-	-	Min. Postorbital br.	MV	47	95.4	4.60	4.82	1.77	0.134	2.54	0.013	CC	17	99.1	6.12	6.18	Min. Bi-Temporal lines	MV	47	87.0	7.83	9.00	1.07	0.812	3.47	0.001	CC	17	94.7	8.12	8.57																																																																																																																																																																																														
Metopion height	MV	47	25.6	2.20	8.61	2.73	0.008	3.46	0.001																																																																																																																																																																																																																																																																																								
	CC	17	23.0	3.64	15.82					Nasion-Metopion	MV	47	51.0	3.34	6.56	2.52	0.015	2.54	0.014	CC	17	53.8	5.31	9.86	Max. Supraorbital br.	MV	47	108.5	3.48	3.20	1.41	0.364	7.02	0.000	CC	16	115.9	4.13	3.57	Max. Posterior Frontal br.	MV	16	110.7	3.13	2.83	-	-	-	-	CC	1	110.0	-	-	Min. Postorbital br.	MV	47	95.4	4.60	4.82	1.77	0.134	2.54	0.013	CC	17	99.1	6.12	6.18	Min. Bi-Temporal lines	MV	47	87.0	7.83	9.00	1.07	0.812	3.47	0.001	CC	17	94.7	8.12	8.57																																																																																																																																																																																																													
Nasion-Metopion	MV	47	51.0	3.34	6.56	2.52	0.015	2.54	0.014																																																																																																																																																																																																																																																																																								
	CC	17	53.8	5.31	9.86					Max. Supraorbital br.	MV	47	108.5	3.48	3.20	1.41	0.364	7.02	0.000	CC	16	115.9	4.13	3.57	Max. Posterior Frontal br.	MV	16	110.7	3.13	2.83	-	-	-	-	CC	1	110.0	-	-	Min. Postorbital br.	MV	47	95.4	4.60	4.82	1.77	0.134	2.54	0.013	CC	17	99.1	6.12	6.18	Min. Bi-Temporal lines	MV	47	87.0	7.83	9.00	1.07	0.812	3.47	0.001	CC	17	94.7	8.12	8.57																																																																																																																																																																																																																												
Max. Supraorbital br.	MV	47	108.5	3.48	3.20	1.41	0.364	7.02	0.000																																																																																																																																																																																																																																																																																								
	CC	16	115.9	4.13	3.57					Max. Posterior Frontal br.	MV	16	110.7	3.13	2.83	-	-	-	-	CC	1	110.0	-	-	Min. Postorbital br.	MV	47	95.4	4.60	4.82	1.77	0.134	2.54	0.013	CC	17	99.1	6.12	6.18	Min. Bi-Temporal lines	MV	47	87.0	7.83	9.00	1.07	0.812	3.47	0.001	CC	17	94.7	8.12	8.57																																																																																																																																																																																																																																											
Max. Posterior Frontal br.	MV	16	110.7	3.13	2.83	-	-	-	-																																																																																																																																																																																																																																																																																								
	CC	1	110.0	-	-					Min. Postorbital br.	MV	47	95.4	4.60	4.82	1.77	0.134	2.54	0.013	CC	17	99.1	6.12	6.18	Min. Bi-Temporal lines	MV	47	87.0	7.83	9.00	1.07	0.812	3.47	0.001	CC	17	94.7	8.12	8.57																																																																																																																																																																																																																																																										
Min. Postorbital br.	MV	47	95.4	4.60	4.82	1.77	0.134	2.54	0.013																																																																																																																																																																																																																																																																																								
	CC	17	99.1	6.12	6.18					Min. Bi-Temporal lines	MV	47	87.0	7.83	9.00	1.07	0.812	3.47	0.001	CC	17	94.7	8.12	8.57																																																																																																																																																																																																																																																																									
Min. Bi-Temporal lines	MV	47	87.0	7.83	9.00	1.07	0.812	3.47	0.001																																																																																																																																																																																																																																																																																								
	CC	17	94.7	8.12	8.57																																																																																																																																																																																																																																																																																												

*T calculated using separate variance estimate

		n	\bar{X}	s	CV	F	P	T	P
Bi-Zygion	MV	44	135.5	5.00	3.69				
	CC	6	144.5	3.97	2.73	1.62	0.626	4.18	0.000
Bi-Zygomaxillary	MV	47	94.4	4.18	4.42				
	CC	12	102.0	4.84	4.75	1.34	0.466	5.40	0.000
Bi-Stephanion	MV	47	92.1	7.62	8.28				
	CC	17	105.1	8.04	7.65	1.11	0.747	5.97	0.000
Bi-Stenionic	MV	47	71.8	3.78	5.29				
	CC	17	72.4	3.22	4.45	1.38	0.489	0.60	0.551
Opisthion-Inion	MV	45	47.4	4.86	10.24				
	CC	17	44.4	4.06	9.15	1.43	0.439	2.32	0.024
Opisthion-Lambda	MV	46	94.5	3.38	3.69				
	CC	17	102.1	6.04	5.92	3.00	0.004	4.88*	0.000
Opisthion-Asterion	MV	46	65.9	3.05	4.64				
	CC	17	66.2	2.53	3.83	1.45	0.421	0.31	0.758
Opisthion-Glabella	MV	44	145.5	5.16	3.54				
	CC	17	147.5	3.87	2.63	1.77	0.214	1.42	0.162
Foramen Magnum length	MV	43	36.1	1.70	4.73				
	CC	17	37.1	2.08	5.63	1.50	0.294	1.92	0.060
Foramen Magnum breadth	MV	44	30.4	2.37	7.81				
	CC	16	31.0	2.47	7.99	1.09	0.792	0.81	0.421
Basion-Sphenobasion	MV	42	21.8	2.16	9.90				
	CC	17	23.1	1.97	8.53	1.20	0.712	2.13	0.037
Basion-Asterion	MV	45	77.8	3.78	4.86				
	CC	17	80.7	5.40	6.69	2.04	0.063	2.44	0.018
Basion-Mastoidale	MV	44	52.3	2.83	5.40				
	CC	17	54.5	1.66	3.05	2.90	0.024	3.65*	0.001
Basion-Staphylion	MV	44	47.7	2.49	5.22				
	CC	10	49.7	3.40	6.84	1.86	0.168	2.11	0.040
Lambda-Bregma	MV	46	117.3	5.04	4.30				
	CC	17	121.1	5.96	4.93	1.40	0.371	2.48	0.016
Lambda-Inion	MV	47	61.1	5.25	8.59				
	CC	17	68.9	7.86	11.40	2.24	0.034	3.79*	0.001
Lambda-Asterion	MV	47	82.3	3.57	4.34				
	CC	17	87.7	5.30	6.04	2.19	0.039	3.85*	0.001
Auriculare-Bregma	MV	47	123.4	4.01	3.25				
	CC	17	132.3	3.85	2.91	1.08	0.903	7.93	0.000
Auriculare-Glabella	MV	47	118.3	4.19	3.55				
	CC	17	121.0	4.06	3.36	1.07	0.928	2.28	0.026
Auriculare-Nasion	MV	47	111.9	4.30	3.85				
	CC	17	114.6	3.75	3.28	1.31	0.563	2.31	0.024

*T calculated using separate variance estimate

		n	\bar{X}	s	CV	F	P	T	P																																																																																																																																																																																																																																																																																								
Auriculare-Nasospinale	MV	47	119.2	4.67	3.92	3.15	0.028	3.60*	0.001																																																																																																																																																																																																																																																																																								
	CC	14	122.7	2.63	2.15					Auriculare-Prosthion	MV	47	129.8	4.88	3.76	2.95	0.046	2.56*	0.015	CC	13	132.6	2.84	2.14	Auriculare-Zygomaxillary	MV	47	78.4	4.11	5.24	1.14	0.821	1.24	0.219	CC	15	76.9	3.84	4.99	Auriculare-Lambda	MV	47	116.2	3.63	3.12	2.83	0.006	6.30*	0.000	CC	17	126.1	6.11	4.85	Auriculare-Inion	MV	47	101.8	3.81	3.75	1.12	0.726	1.58	0.119	CC	17	100.1	4.04	4.04	Auriculare-Opisthion	MV	46	77.0	3.00	3.89	1.43	0.442	2.41	0.019	CC	17	79.0	2.51	3.18	Auriculare-Basion	MV	45	66.1	3.14	4.75	2.32	0.070	2.85	0.006	CC	17	68.5	2.06	3.01	Auriculare-Asterion	MV	45	49.3	2.63	5.35	3.96	0.000	4.27*	0.000	CC	17	55.0	5.24	9.53	Nasion-Nasospinale	MV	47	49.9	2.66	5.33	1.44	0.354	5.10	0.000	CC	14	54.2	3.19	5.89	Nasion-Prosthion	MV	47	70.5	3.91	5.54	1.95	0.208	3.81	0.000	CC	13	75.0	2.79	3.73	Nasospinale-Prosthion	MV	47	20.7	2.85	13.77	1.04	0.991	0.40	0.691	CC	14	20.3	2.79	13.70	Nasal breadth	MV	47	28.3	2.07	7.33	2.35	0.083	2.04	0.046	CC	15	29.5	1.35	4.59	Orbital height	MV	47	32.9	2.50	7.61	1.15	0.690	2.21	0.031	CC	15	31.2	2.68	8.59	Orbital breadth	MV	47	44.5	1.97	4.44	1.06	0.834	1.15	0.255	CC	14	43.8	2.03	4.64	Bi-Ectoconchion	MV	46	104.3	3.48	3.35	1.02	0.897	4.00	0.000	CC	13	108.6	3.52	3.24	Frontal arc	MV	46	130.2	5.59	4.29	1.09	0.886	3.32	0.002	CC	17	135.4	5.35	3.95	Parietal arc	MV	42	130.1	6.14	4.72	1.32	0.460	2.88	0.006	CC	17	135.4	7.06	5.21	Occipital arc	MV	43	113.6	4.95	4.36	2.12	0.053	3.92*	0.000	CC	17	121.1	7.20	5.95	Alveolar length	MV	47	64.1	3.98	6.20	2.27	0.110	0.65	0.519	CC	14	64.9	2.64	4.07	Alveolar breadth	MV	47	69.3	3.55	5.12	1.13	0.724	3.62	0.001
Auriculare-Prosthion	MV	47	129.8	4.88	3.76	2.95	0.046	2.56*	0.015																																																																																																																																																																																																																																																																																								
	CC	13	132.6	2.84	2.14					Auriculare-Zygomaxillary	MV	47	78.4	4.11	5.24	1.14	0.821	1.24	0.219	CC	15	76.9	3.84	4.99	Auriculare-Lambda	MV	47	116.2	3.63	3.12	2.83	0.006	6.30*	0.000	CC	17	126.1	6.11	4.85	Auriculare-Inion	MV	47	101.8	3.81	3.75	1.12	0.726	1.58	0.119	CC	17	100.1	4.04	4.04	Auriculare-Opisthion	MV	46	77.0	3.00	3.89	1.43	0.442	2.41	0.019	CC	17	79.0	2.51	3.18	Auriculare-Basion	MV	45	66.1	3.14	4.75	2.32	0.070	2.85	0.006	CC	17	68.5	2.06	3.01	Auriculare-Asterion	MV	45	49.3	2.63	5.35	3.96	0.000	4.27*	0.000	CC	17	55.0	5.24	9.53	Nasion-Nasospinale	MV	47	49.9	2.66	5.33	1.44	0.354	5.10	0.000	CC	14	54.2	3.19	5.89	Nasion-Prosthion	MV	47	70.5	3.91	5.54	1.95	0.208	3.81	0.000	CC	13	75.0	2.79	3.73	Nasospinale-Prosthion	MV	47	20.7	2.85	13.77	1.04	0.991	0.40	0.691	CC	14	20.3	2.79	13.70	Nasal breadth	MV	47	28.3	2.07	7.33	2.35	0.083	2.04	0.046	CC	15	29.5	1.35	4.59	Orbital height	MV	47	32.9	2.50	7.61	1.15	0.690	2.21	0.031	CC	15	31.2	2.68	8.59	Orbital breadth	MV	47	44.5	1.97	4.44	1.06	0.834	1.15	0.255	CC	14	43.8	2.03	4.64	Bi-Ectoconchion	MV	46	104.3	3.48	3.35	1.02	0.897	4.00	0.000	CC	13	108.6	3.52	3.24	Frontal arc	MV	46	130.2	5.59	4.29	1.09	0.886	3.32	0.002	CC	17	135.4	5.35	3.95	Parietal arc	MV	42	130.1	6.14	4.72	1.32	0.460	2.88	0.006	CC	17	135.4	7.06	5.21	Occipital arc	MV	43	113.6	4.95	4.36	2.12	0.053	3.92*	0.000	CC	17	121.1	7.20	5.95	Alveolar length	MV	47	64.1	3.98	6.20	2.27	0.110	0.65	0.519	CC	14	64.9	2.64	4.07	Alveolar breadth	MV	47	69.3	3.55	5.12	1.13	0.724	3.62	0.001	CC	14	73.2	3.77	5.15										
Auriculare-Zygomaxillary	MV	47	78.4	4.11	5.24	1.14	0.821	1.24	0.219																																																																																																																																																																																																																																																																																								
	CC	15	76.9	3.84	4.99					Auriculare-Lambda	MV	47	116.2	3.63	3.12	2.83	0.006	6.30*	0.000	CC	17	126.1	6.11	4.85	Auriculare-Inion	MV	47	101.8	3.81	3.75	1.12	0.726	1.58	0.119	CC	17	100.1	4.04	4.04	Auriculare-Opisthion	MV	46	77.0	3.00	3.89	1.43	0.442	2.41	0.019	CC	17	79.0	2.51	3.18	Auriculare-Basion	MV	45	66.1	3.14	4.75	2.32	0.070	2.85	0.006	CC	17	68.5	2.06	3.01	Auriculare-Asterion	MV	45	49.3	2.63	5.35	3.96	0.000	4.27*	0.000	CC	17	55.0	5.24	9.53	Nasion-Nasospinale	MV	47	49.9	2.66	5.33	1.44	0.354	5.10	0.000	CC	14	54.2	3.19	5.89	Nasion-Prosthion	MV	47	70.5	3.91	5.54	1.95	0.208	3.81	0.000	CC	13	75.0	2.79	3.73	Nasospinale-Prosthion	MV	47	20.7	2.85	13.77	1.04	0.991	0.40	0.691	CC	14	20.3	2.79	13.70	Nasal breadth	MV	47	28.3	2.07	7.33	2.35	0.083	2.04	0.046	CC	15	29.5	1.35	4.59	Orbital height	MV	47	32.9	2.50	7.61	1.15	0.690	2.21	0.031	CC	15	31.2	2.68	8.59	Orbital breadth	MV	47	44.5	1.97	4.44	1.06	0.834	1.15	0.255	CC	14	43.8	2.03	4.64	Bi-Ectoconchion	MV	46	104.3	3.48	3.35	1.02	0.897	4.00	0.000	CC	13	108.6	3.52	3.24	Frontal arc	MV	46	130.2	5.59	4.29	1.09	0.886	3.32	0.002	CC	17	135.4	5.35	3.95	Parietal arc	MV	42	130.1	6.14	4.72	1.32	0.460	2.88	0.006	CC	17	135.4	7.06	5.21	Occipital arc	MV	43	113.6	4.95	4.36	2.12	0.053	3.92*	0.000	CC	17	121.1	7.20	5.95	Alveolar length	MV	47	64.1	3.98	6.20	2.27	0.110	0.65	0.519	CC	14	64.9	2.64	4.07	Alveolar breadth	MV	47	69.3	3.55	5.12	1.13	0.724	3.62	0.001	CC	14	73.2	3.77	5.15																									
Auriculare-Lambda	MV	47	116.2	3.63	3.12	2.83	0.006	6.30*	0.000																																																																																																																																																																																																																																																																																								
	CC	17	126.1	6.11	4.85					Auriculare-Inion	MV	47	101.8	3.81	3.75	1.12	0.726	1.58	0.119	CC	17	100.1	4.04	4.04	Auriculare-Opisthion	MV	46	77.0	3.00	3.89	1.43	0.442	2.41	0.019	CC	17	79.0	2.51	3.18	Auriculare-Basion	MV	45	66.1	3.14	4.75	2.32	0.070	2.85	0.006	CC	17	68.5	2.06	3.01	Auriculare-Asterion	MV	45	49.3	2.63	5.35	3.96	0.000	4.27*	0.000	CC	17	55.0	5.24	9.53	Nasion-Nasospinale	MV	47	49.9	2.66	5.33	1.44	0.354	5.10	0.000	CC	14	54.2	3.19	5.89	Nasion-Prosthion	MV	47	70.5	3.91	5.54	1.95	0.208	3.81	0.000	CC	13	75.0	2.79	3.73	Nasospinale-Prosthion	MV	47	20.7	2.85	13.77	1.04	0.991	0.40	0.691	CC	14	20.3	2.79	13.70	Nasal breadth	MV	47	28.3	2.07	7.33	2.35	0.083	2.04	0.046	CC	15	29.5	1.35	4.59	Orbital height	MV	47	32.9	2.50	7.61	1.15	0.690	2.21	0.031	CC	15	31.2	2.68	8.59	Orbital breadth	MV	47	44.5	1.97	4.44	1.06	0.834	1.15	0.255	CC	14	43.8	2.03	4.64	Bi-Ectoconchion	MV	46	104.3	3.48	3.35	1.02	0.897	4.00	0.000	CC	13	108.6	3.52	3.24	Frontal arc	MV	46	130.2	5.59	4.29	1.09	0.886	3.32	0.002	CC	17	135.4	5.35	3.95	Parietal arc	MV	42	130.1	6.14	4.72	1.32	0.460	2.88	0.006	CC	17	135.4	7.06	5.21	Occipital arc	MV	43	113.6	4.95	4.36	2.12	0.053	3.92*	0.000	CC	17	121.1	7.20	5.95	Alveolar length	MV	47	64.1	3.98	6.20	2.27	0.110	0.65	0.519	CC	14	64.9	2.64	4.07	Alveolar breadth	MV	47	69.3	3.55	5.12	1.13	0.724	3.62	0.001	CC	14	73.2	3.77	5.15																																								
Auriculare-Inion	MV	47	101.8	3.81	3.75	1.12	0.726	1.58	0.119																																																																																																																																																																																																																																																																																								
	CC	17	100.1	4.04	4.04					Auriculare-Opisthion	MV	46	77.0	3.00	3.89	1.43	0.442	2.41	0.019	CC	17	79.0	2.51	3.18	Auriculare-Basion	MV	45	66.1	3.14	4.75	2.32	0.070	2.85	0.006	CC	17	68.5	2.06	3.01	Auriculare-Asterion	MV	45	49.3	2.63	5.35	3.96	0.000	4.27*	0.000	CC	17	55.0	5.24	9.53	Nasion-Nasospinale	MV	47	49.9	2.66	5.33	1.44	0.354	5.10	0.000	CC	14	54.2	3.19	5.89	Nasion-Prosthion	MV	47	70.5	3.91	5.54	1.95	0.208	3.81	0.000	CC	13	75.0	2.79	3.73	Nasospinale-Prosthion	MV	47	20.7	2.85	13.77	1.04	0.991	0.40	0.691	CC	14	20.3	2.79	13.70	Nasal breadth	MV	47	28.3	2.07	7.33	2.35	0.083	2.04	0.046	CC	15	29.5	1.35	4.59	Orbital height	MV	47	32.9	2.50	7.61	1.15	0.690	2.21	0.031	CC	15	31.2	2.68	8.59	Orbital breadth	MV	47	44.5	1.97	4.44	1.06	0.834	1.15	0.255	CC	14	43.8	2.03	4.64	Bi-Ectoconchion	MV	46	104.3	3.48	3.35	1.02	0.897	4.00	0.000	CC	13	108.6	3.52	3.24	Frontal arc	MV	46	130.2	5.59	4.29	1.09	0.886	3.32	0.002	CC	17	135.4	5.35	3.95	Parietal arc	MV	42	130.1	6.14	4.72	1.32	0.460	2.88	0.006	CC	17	135.4	7.06	5.21	Occipital arc	MV	43	113.6	4.95	4.36	2.12	0.053	3.92*	0.000	CC	17	121.1	7.20	5.95	Alveolar length	MV	47	64.1	3.98	6.20	2.27	0.110	0.65	0.519	CC	14	64.9	2.64	4.07	Alveolar breadth	MV	47	69.3	3.55	5.12	1.13	0.724	3.62	0.001	CC	14	73.2	3.77	5.15																																																							
Auriculare-Opisthion	MV	46	77.0	3.00	3.89	1.43	0.442	2.41	0.019																																																																																																																																																																																																																																																																																								
	CC	17	79.0	2.51	3.18					Auriculare-Basion	MV	45	66.1	3.14	4.75	2.32	0.070	2.85	0.006	CC	17	68.5	2.06	3.01	Auriculare-Asterion	MV	45	49.3	2.63	5.35	3.96	0.000	4.27*	0.000	CC	17	55.0	5.24	9.53	Nasion-Nasospinale	MV	47	49.9	2.66	5.33	1.44	0.354	5.10	0.000	CC	14	54.2	3.19	5.89	Nasion-Prosthion	MV	47	70.5	3.91	5.54	1.95	0.208	3.81	0.000	CC	13	75.0	2.79	3.73	Nasospinale-Prosthion	MV	47	20.7	2.85	13.77	1.04	0.991	0.40	0.691	CC	14	20.3	2.79	13.70	Nasal breadth	MV	47	28.3	2.07	7.33	2.35	0.083	2.04	0.046	CC	15	29.5	1.35	4.59	Orbital height	MV	47	32.9	2.50	7.61	1.15	0.690	2.21	0.031	CC	15	31.2	2.68	8.59	Orbital breadth	MV	47	44.5	1.97	4.44	1.06	0.834	1.15	0.255	CC	14	43.8	2.03	4.64	Bi-Ectoconchion	MV	46	104.3	3.48	3.35	1.02	0.897	4.00	0.000	CC	13	108.6	3.52	3.24	Frontal arc	MV	46	130.2	5.59	4.29	1.09	0.886	3.32	0.002	CC	17	135.4	5.35	3.95	Parietal arc	MV	42	130.1	6.14	4.72	1.32	0.460	2.88	0.006	CC	17	135.4	7.06	5.21	Occipital arc	MV	43	113.6	4.95	4.36	2.12	0.053	3.92*	0.000	CC	17	121.1	7.20	5.95	Alveolar length	MV	47	64.1	3.98	6.20	2.27	0.110	0.65	0.519	CC	14	64.9	2.64	4.07	Alveolar breadth	MV	47	69.3	3.55	5.12	1.13	0.724	3.62	0.001	CC	14	73.2	3.77	5.15																																																																						
Auriculare-Basion	MV	45	66.1	3.14	4.75	2.32	0.070	2.85	0.006																																																																																																																																																																																																																																																																																								
	CC	17	68.5	2.06	3.01					Auriculare-Asterion	MV	45	49.3	2.63	5.35	3.96	0.000	4.27*	0.000	CC	17	55.0	5.24	9.53	Nasion-Nasospinale	MV	47	49.9	2.66	5.33	1.44	0.354	5.10	0.000	CC	14	54.2	3.19	5.89	Nasion-Prosthion	MV	47	70.5	3.91	5.54	1.95	0.208	3.81	0.000	CC	13	75.0	2.79	3.73	Nasospinale-Prosthion	MV	47	20.7	2.85	13.77	1.04	0.991	0.40	0.691	CC	14	20.3	2.79	13.70	Nasal breadth	MV	47	28.3	2.07	7.33	2.35	0.083	2.04	0.046	CC	15	29.5	1.35	4.59	Orbital height	MV	47	32.9	2.50	7.61	1.15	0.690	2.21	0.031	CC	15	31.2	2.68	8.59	Orbital breadth	MV	47	44.5	1.97	4.44	1.06	0.834	1.15	0.255	CC	14	43.8	2.03	4.64	Bi-Ectoconchion	MV	46	104.3	3.48	3.35	1.02	0.897	4.00	0.000	CC	13	108.6	3.52	3.24	Frontal arc	MV	46	130.2	5.59	4.29	1.09	0.886	3.32	0.002	CC	17	135.4	5.35	3.95	Parietal arc	MV	42	130.1	6.14	4.72	1.32	0.460	2.88	0.006	CC	17	135.4	7.06	5.21	Occipital arc	MV	43	113.6	4.95	4.36	2.12	0.053	3.92*	0.000	CC	17	121.1	7.20	5.95	Alveolar length	MV	47	64.1	3.98	6.20	2.27	0.110	0.65	0.519	CC	14	64.9	2.64	4.07	Alveolar breadth	MV	47	69.3	3.55	5.12	1.13	0.724	3.62	0.001	CC	14	73.2	3.77	5.15																																																																																					
Auriculare-Asterion	MV	45	49.3	2.63	5.35	3.96	0.000	4.27*	0.000																																																																																																																																																																																																																																																																																								
	CC	17	55.0	5.24	9.53					Nasion-Nasospinale	MV	47	49.9	2.66	5.33	1.44	0.354	5.10	0.000	CC	14	54.2	3.19	5.89	Nasion-Prosthion	MV	47	70.5	3.91	5.54	1.95	0.208	3.81	0.000	CC	13	75.0	2.79	3.73	Nasospinale-Prosthion	MV	47	20.7	2.85	13.77	1.04	0.991	0.40	0.691	CC	14	20.3	2.79	13.70	Nasal breadth	MV	47	28.3	2.07	7.33	2.35	0.083	2.04	0.046	CC	15	29.5	1.35	4.59	Orbital height	MV	47	32.9	2.50	7.61	1.15	0.690	2.21	0.031	CC	15	31.2	2.68	8.59	Orbital breadth	MV	47	44.5	1.97	4.44	1.06	0.834	1.15	0.255	CC	14	43.8	2.03	4.64	Bi-Ectoconchion	MV	46	104.3	3.48	3.35	1.02	0.897	4.00	0.000	CC	13	108.6	3.52	3.24	Frontal arc	MV	46	130.2	5.59	4.29	1.09	0.886	3.32	0.002	CC	17	135.4	5.35	3.95	Parietal arc	MV	42	130.1	6.14	4.72	1.32	0.460	2.88	0.006	CC	17	135.4	7.06	5.21	Occipital arc	MV	43	113.6	4.95	4.36	2.12	0.053	3.92*	0.000	CC	17	121.1	7.20	5.95	Alveolar length	MV	47	64.1	3.98	6.20	2.27	0.110	0.65	0.519	CC	14	64.9	2.64	4.07	Alveolar breadth	MV	47	69.3	3.55	5.12	1.13	0.724	3.62	0.001	CC	14	73.2	3.77	5.15																																																																																																				
Nasion-Nasospinale	MV	47	49.9	2.66	5.33	1.44	0.354	5.10	0.000																																																																																																																																																																																																																																																																																								
	CC	14	54.2	3.19	5.89					Nasion-Prosthion	MV	47	70.5	3.91	5.54	1.95	0.208	3.81	0.000	CC	13	75.0	2.79	3.73	Nasospinale-Prosthion	MV	47	20.7	2.85	13.77	1.04	0.991	0.40	0.691	CC	14	20.3	2.79	13.70	Nasal breadth	MV	47	28.3	2.07	7.33	2.35	0.083	2.04	0.046	CC	15	29.5	1.35	4.59	Orbital height	MV	47	32.9	2.50	7.61	1.15	0.690	2.21	0.031	CC	15	31.2	2.68	8.59	Orbital breadth	MV	47	44.5	1.97	4.44	1.06	0.834	1.15	0.255	CC	14	43.8	2.03	4.64	Bi-Ectoconchion	MV	46	104.3	3.48	3.35	1.02	0.897	4.00	0.000	CC	13	108.6	3.52	3.24	Frontal arc	MV	46	130.2	5.59	4.29	1.09	0.886	3.32	0.002	CC	17	135.4	5.35	3.95	Parietal arc	MV	42	130.1	6.14	4.72	1.32	0.460	2.88	0.006	CC	17	135.4	7.06	5.21	Occipital arc	MV	43	113.6	4.95	4.36	2.12	0.053	3.92*	0.000	CC	17	121.1	7.20	5.95	Alveolar length	MV	47	64.1	3.98	6.20	2.27	0.110	0.65	0.519	CC	14	64.9	2.64	4.07	Alveolar breadth	MV	47	69.3	3.55	5.12	1.13	0.724	3.62	0.001	CC	14	73.2	3.77	5.15																																																																																																																			
Nasion-Prosthion	MV	47	70.5	3.91	5.54	1.95	0.208	3.81	0.000																																																																																																																																																																																																																																																																																								
	CC	13	75.0	2.79	3.73					Nasospinale-Prosthion	MV	47	20.7	2.85	13.77	1.04	0.991	0.40	0.691	CC	14	20.3	2.79	13.70	Nasal breadth	MV	47	28.3	2.07	7.33	2.35	0.083	2.04	0.046	CC	15	29.5	1.35	4.59	Orbital height	MV	47	32.9	2.50	7.61	1.15	0.690	2.21	0.031	CC	15	31.2	2.68	8.59	Orbital breadth	MV	47	44.5	1.97	4.44	1.06	0.834	1.15	0.255	CC	14	43.8	2.03	4.64	Bi-Ectoconchion	MV	46	104.3	3.48	3.35	1.02	0.897	4.00	0.000	CC	13	108.6	3.52	3.24	Frontal arc	MV	46	130.2	5.59	4.29	1.09	0.886	3.32	0.002	CC	17	135.4	5.35	3.95	Parietal arc	MV	42	130.1	6.14	4.72	1.32	0.460	2.88	0.006	CC	17	135.4	7.06	5.21	Occipital arc	MV	43	113.6	4.95	4.36	2.12	0.053	3.92*	0.000	CC	17	121.1	7.20	5.95	Alveolar length	MV	47	64.1	3.98	6.20	2.27	0.110	0.65	0.519	CC	14	64.9	2.64	4.07	Alveolar breadth	MV	47	69.3	3.55	5.12	1.13	0.724	3.62	0.001	CC	14	73.2	3.77	5.15																																																																																																																																		
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	CC	15	31.2	2.68	8.59					Orbital breadth	MV	47	44.5	1.97	4.44	1.06	0.834	1.15	0.255	CC	14	43.8	2.03	4.64	Bi-Ectoconchion	MV	46	104.3	3.48	3.35	1.02	0.897	4.00	0.000	CC	13	108.6	3.52	3.24	Frontal arc	MV	46	130.2	5.59	4.29	1.09	0.886	3.32	0.002	CC	17	135.4	5.35	3.95	Parietal arc	MV	42	130.1	6.14	4.72	1.32	0.460	2.88	0.006	CC	17	135.4	7.06	5.21	Occipital arc	MV	43	113.6	4.95	4.36	2.12	0.053	3.92*	0.000	CC	17	121.1	7.20	5.95	Alveolar length	MV	47	64.1	3.98	6.20	2.27	0.110	0.65	0.519	CC	14	64.9	2.64	4.07	Alveolar breadth	MV	47	69.3	3.55	5.12	1.13	0.724	3.62	0.001	CC	14	73.2	3.77	5.15																																																																																																																																																																															
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Bi-Ectoconchion	MV	46	104.3	3.48	3.35	1.02	0.897	4.00	0.000																																																																																																																																																																																																																																																																																								
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Frontal arc	MV	46	130.2	5.59	4.29	1.09	0.886	3.32	0.002																																																																																																																																																																																																																																																																																								
	CC	17	135.4	5.35	3.95					Parietal arc	MV	42	130.1	6.14	4.72	1.32	0.460	2.88	0.006	CC	17	135.4	7.06	5.21	Occipital arc	MV	43	113.6	4.95	4.36	2.12	0.053	3.92*	0.000	CC	17	121.1	7.20	5.95	Alveolar length	MV	47	64.1	3.98	6.20	2.27	0.110	0.65	0.519	CC	14	64.9	2.64	4.07	Alveolar breadth	MV	47	69.3	3.55	5.12	1.13	0.724	3.62	0.001	CC	14	73.2	3.77	5.15																																																																																																																																																																																																																												
Parietal arc	MV	42	130.1	6.14	4.72	1.32	0.460	2.88	0.006																																																																																																																																																																																																																																																																																								
	CC	17	135.4	7.06	5.21					Occipital arc	MV	43	113.6	4.95	4.36	2.12	0.053	3.92*	0.000	CC	17	121.1	7.20	5.95	Alveolar length	MV	47	64.1	3.98	6.20	2.27	0.110	0.65	0.519	CC	14	64.9	2.64	4.07	Alveolar breadth	MV	47	69.3	3.55	5.12	1.13	0.724	3.62	0.001	CC	14	73.2	3.77	5.15																																																																																																																																																																																																																																											
Occipital arc	MV	43	113.6	4.95	4.36	2.12	0.053	3.92*	0.000																																																																																																																																																																																																																																																																																								
	CC	17	121.1	7.20	5.95					Alveolar length	MV	47	64.1	3.98	6.20	2.27	0.110	0.65	0.519	CC	14	64.9	2.64	4.07	Alveolar breadth	MV	47	69.3	3.55	5.12	1.13	0.724	3.62	0.001	CC	14	73.2	3.77	5.15																																																																																																																																																																																																																																																										
Alveolar length	MV	47	64.1	3.98	6.20	2.27	0.110	0.65	0.519																																																																																																																																																																																																																																																																																								
	CC	14	64.9	2.64	4.07					Alveolar breadth	MV	47	69.3	3.55	5.12	1.13	0.724	3.62	0.001	CC	14	73.2	3.77	5.15																																																																																																																																																																																																																																																																									
Alveolar breadth	MV	47	69.3	3.55	5.12	1.13	0.724	3.62	0.001																																																																																																																																																																																																																																																																																								
	CC	14	73.2	3.77	5.15																																																																																																																																																																																																																																																																																												

*T calculated using separate variance estimate

		n	\bar{x}	s	CV	F	P	T	P
Mastoid depth	MV	47	31.2	2.35	7.55				
	CC	17	31.5	2.93	9.32	1.55	0.244	0.44	0.659
Bi-Canine breadth	MV	47	46.5	2.33	5.01				
	CC	13	48.7	3.14	6.44	1.82	0.147	2.86	0.006
Parietal Subtense height	MV	44	23.3	1.93	8.31				
	CC	17	25.3	2.86	11.34	2.18	0.043	2.55*	0.018
Bregma-Parietal Subtense	MV	44	59.5	4.63	7.78				
	CC	17	61.8	4.99	8.07	1.16	0.672	1.69	0.097

Table 51
Comparative statistics for the Coobool Creek (CC) and Swanport (SW) male crania (mm.)

		n	\bar{X}	s	CV	F	P	T	P
Max. Bi-Parietal breadth	CC	17	138.1	3.98	2.82				
	SW	23	129.9	2.93	2.26	1.84	0.184	7.51	0.000
Glabella-Opisthocranion	CC	17	196.2	5.78	2.95				
	SW	23	189.1	5.33	2.82	1.18	0.710	4.00	0.000
Glabella-Lambda	CC	17	192.8	6.95	3.61				
	SW	23	182.1	5.28	2.90	1.74	0.228	5.51	0.000
Basion-Bregma	CC	17	142.7	5.16	3.62				
	SW	22	128.9	4.82	3.74	1.14	0.760	8.42	0.000
Basion-Nasion	CC	17	104.7	3.49	3.33				
	SW	22	101.4	3.51	3.46	1.01	0.995	2.97	0.005
Basion-Nasospinale	CC	14	102.3	3.50	3.42				
	SW	22	99.0	3.90	3.95	1.25	0.694	2.58	0.014
Basion-Prosthion	CC	13	109.8	4.07	3.71				
	SW	21	104.5	4.77	4.56	1.37	0.586	3.33	0.002
Basion-Lambda	CC	17	123.9	6.59	5.32				
	SW	17	110.5	6.15	5.56	1.15	0.788	6.11	0.000
Basion-Inion	CC	17	78.4	4.69	5.98				
	SW	17	72.1	3.30	4.57	2.02	0.171	4.52	0.000
Bi-Auriculare	CC	16	126.4	3.09	2.45				
	SW	17	120.5	3.89	3.22	1.58	0.384	4.76	0.000
Bi-Asterion	CC	17	110.8	4.12	3.72				
	SW	18	109.6	3.43	3.13	1.45	0.457	0.90	0.373
Bi-Sphenion	CC	15	108.2	5.32	4.91				
	SW	22	101.4	3.98	3.93	1.78	0.224	4.44	0.000
Glabella-Bregma	CC	17	117.7	5.20	4.42				
	SW	23	109.3	3.43	3.14	2.30	0.070	5.79*	0.000
Nasion-Bregma	CC	17	120.9	5.25	4.34				
	SW	23	112.3	3.14	2.79	2.80	0.026	6.03*	0.000
Metopion height	CC	17	23.0	3.64	15.82				
	SW	23	25.1	2.69	9.01	2.58	0.040	2.11*	0.045
Nasion-Metopion	CC	17	53.8	5.31	9.86				
	SW	23	49.9	2.95	5.92	3.24	0.011	2.78*	0.011
Max. Supraorbital breadth	CC	16	115.9	4.13	3.57				
	SW	23	109.7	3.76	3.43	1.21	0.673	4.85	0.000
Min. Postorbital breadth	CC	17	99.1	6.12	6.18				
	SW	23	95.5	4.09	4.29	2.23	0.091	2.20	0.034
Min. Bi-Temporal lines	CC	17	94.7	8.12	8.57				
	SW	18	85.9	10.60	12.34	1.70	0.293	2.75	0.010
Bi-Zygion	CC	6	144.5	3.93	2.73				
	SW	18	136.8	3.02	4.25	1.69	0.381	4.96	0.000

*T calculated using separate variance estimate

		n	\bar{X}	s	CV	F	P	T	P
Bi-Zygomaxillary	CC	12	102.0	4.83	4.75				
	SW	23	96.8	4.02	3.70	1.45	0.443	3.34	0.002
Bi-Stephanion	CC	17	105.1	8.04	7.65				
	SW	18	92.7	10.04	7.03	1.56	0.379	4.03	0.000
Bi-Stenionic	CC	17	72.4	3.22	4.45				
	SW	16	71.5	3.20	3.87	1.01	0.986	0.87	0.393
Opisthion-Inion	CC	17	44.4	4.06	9.15				
	SW	18	37.7	4.26	18.96	1.10	0.851	4.71	0.000
Opisthion-Lambda	CC	17	102.1	6.04	5.92				
	SW	18	92.6	3.66	7.98	2.72	0.048	5.59*	0.000
Opisthion-Asterion	CC	17	66.2	2.53	3.83				
	SW	18	62.6	3.19	8.39	1.59	0.360	3.64	0.001
Opisthion-Glabella	CC	17	147.5	3.87	2.63				
	SW	18	143.8	4.88	3.94	1.59	0.360	2.43	0.021
Basion-Asterion	CC	17	80.7	5.40	6.69				
	SW	17	75.2	3.72	4.94	2.11	0.146	3.44	0.002
Basion-Mastoidale	CC	17	54.5	1.66	3.05				
	SW	17	53.4	2.55	4.77	2.35	0.097	1.51	0.140
Basion-Staphylion	CC	10	49.7	3.40	6.84				
	SW	17	47.8	3.23	6.76	1.10	0.826	1.38	0.179
Lambda-Bregma	CC	17	121.1	5.96	4.93				
	SW	18	114.2	4.68	4.10	1.62	0.333	3.78	0.001
Lambda-Inion	CC	17	68.9	7.86	11.40				
	SW	17	66.6	5.53	8.30	2.02	0.171	0.98	0.333
Lambda-Asterion	CC	17	87.7	5.30	6.04				
	SW	18	83.1	3.14	3.78	2.85	0.039	3.10*	0.005
Auriculare-Zygomaxillary	CC	15	76.9	3.84	4.99				
	SW	18	76.8	2.65	3.45	2.10	0.148	0.04	0.969
Auriculare-Opisthion	CC	17	79.0	2.51	3.18				
	SW	18	75.2	4.52	6.00	3.24	0.023	3.08*	0.005
Auriculare-Basion	CC	17	68.5	2.06	3.01				
	SW	17	66.8	6.45	9.65	9.76	0.000	1.00*	0.329
Nasion-Nasospinale	CC	14	54.2	3.19	5.89				
	SW	23	51.4	2.25	4.38	2.01	0.143	3.13	0.003
Nasion-Prosthion	CC	13	75.0	2.79	3.73				
	SW	22	67.6	2.88	4.26	1.06	0.942	7.37	0.000
Nasospinale-Prosthion	CC	14	20.3	2.79	13.70				
	SW	22	16.0	2.51	15.68	1.23	0.652	4.81	0.000
Nasal breadth	CC	15	29.5	1.35	4.59				
	SW	18	26.5	1.46	5.53	1.17	0.778	6.12	0.000

*T calculated using separate variance estimate

		n	\bar{X}	s	CV	F	P	T	P
Orbital height	CC	5	32.8	1.64	5.01				
	SW	25	33.4	1.78	5.32	1.18	0.985	0.79	0.438
Orbital breadth	CC	5	43.4	0.89	2.06				
	SW	23	42.1	1.18	2.80	1.74	0.633	2.26	0.033
Bi-Ectoconchion	CC	5	104.4	2.60	2.50				
	SW	25	99.9	3.36	3.36	1.66	0.671	2.78	0.010
Frontal arc	CC	7	128.5	5.56	4.33				
	SW	20	122.8	4.94	4.03	1.26	0.639	2.58	0.016
Parietal arc	CC	7	130.2	4.38	3.37				
	SW	22	123.1	6.79	5.52	2.40	0.281	2.60	0.015
Occipital arc	CC	6	119.8	3.76	3.14				
	SW	23	111.1	6.11	5.49	2.64	0.285	3.29	0.003
Alveolar length	CC	7	61.1	4.14	6.77				
	SW	25	57.6	2.02	3.50	4.20	0.010	2.19*	0.064
Alveolar breadth	CC	7	67.1	2.79	4.16				
	SW	25	62.3	2.85	4.58	1.04	1.000	3.97	0.000
Mastoid depth	CC	6	28.0	2.28	8.14				
	SW	25	24.8	2.43	9.80	1.14	0.980	2.92	0.007
Bi-Canine breadth	CC	7	47.4	2.44	5.14				
	SW	23	42.9	2.05	4.78	1.41	0.511	4.83	0.000
Parietal Subtense height	CC	7	24.4	1.81	7.42				
	SW	22	22.7	2.46	10.84	1.85	0.456	1.63	0.114
Bregma-Parietal Subtense	CC	7	59.2	4.15	8.07				
	SW	22	58.0	5.07	8.74	1.49	0.649	0.59	0.563

Table 52

Comparative statistics for the Coobool Creek (CC) and Broadbeach (BB) male crania (mm.)

		n	\bar{X}	s	CV	F	P	T	P																																																																																																																																																																																																																																																																																								
Max. Bi-Parietal breadth	CC	17	138.1	3.98	2.82	1.29	0.623	4.38	0.000																																																																																																																																																																																																																																																																																								
	BB	15	131.5	4.51	3.43					Glabella-Opisthocranion	CC	17	196.2	5.78	2.95	1.36	0.582	1.91	0.067	BB	14	192.5	4.95	2.57	Glabella-Lambda	CC	17	192.8	6.95	3.61	1.52	0.449	2.49	0.019	BB	14	187.0	5.63	3.01	Basion-Bregma	CC	17	142.2	5.16	3.62	1.11	0.828	2.04	0.050	BB	14	138.5	5.44	3.93	Basion-Nasion	CC	17	104.7	3.49	3.33	1.15	0.819	0.12	0.906	BB	13	104.6	3.25	3.16	Basion-Nasospinale	CC	14	102.3	3.50	3.42	1.12	0.876	3.76	0.001	BB	11	97.1	3.31	3.41	Basion-Prosthion	CC	13	109.8	4.07	3.71	1.76	0.353	3.16	0.005	BB	11	103.7	5.40	5.21	Bi-Sphenion	CC	15	108.2	5.32	4.91	2.97	0.126	2.38	0.027	BB	9	103.5	3.08	2.98	Glabella-Bregma	CC	17	117.7	5.20	4.42	1.17	0.757	2.00	0.054	BB	15	113.8	5.63	4.94	Nasion-Bregma	CC	17	120.9	5.25	4.34	1.07	0.899	1.91	0.065	BB	16	117.5	5.07	4.32	Metopion height	CC	17	23.0	3.64	15.82	1.49	0.446	4.24	0.000	BB	16	28.0	2.98	10.67	Nasion-Metopion	CC	17	53.8	5.31	9.86	2.53	0.080	0.77	0.449	BB	16	52.6	3.34	6.34	Max. Supraorbital breadth	CC	16	115.9	4.13	3.57	1.05	0.901	1.63	0.116	BB	11	113.2	4.24	3.74	Min. Postorbital breadth	CC	17	99.1	6.12	6.18	1.21	0.732	0.58	0.563	BB	14	100.3	5.55	5.53	Bi-Zygion	CC	6	144.5	3.93	2.73	11.62	0.162	1.18	0.275	BB	3	141.6	1.15	0.81	Bi-Zygomaxillary	CC	12	102.0	4.84	4.75	1.11	1.00	0.08	0.938	BB	5	101.8	4.60	4.52	Nasion-Nasospinale	CC	14	54.2	3.19	5.89	1.55	0.448	2.87	0.008	BB	12	50.2	3.98	7.92	Nasion-Prosthion	CC	13	75.0	2.79	3.73	4.79	0.011	5.77*	0.000	BB	13	64.2	6.12	9.54	Nasospinale-Prosthion	CC	14	20.3	2.79	13.70	1.42	0.541	3.50	0.002	BB	12	16.1	3.32	20.57	Orbital height	CC	15	31.2	2.68	8.59	2.22	0.259	3.69	0.001
Glabella-Opisthocranion	CC	17	196.2	5.78	2.95	1.36	0.582	1.91	0.067																																																																																																																																																																																																																																																																																								
	BB	14	192.5	4.95	2.57					Glabella-Lambda	CC	17	192.8	6.95	3.61	1.52	0.449	2.49	0.019	BB	14	187.0	5.63	3.01	Basion-Bregma	CC	17	142.2	5.16	3.62	1.11	0.828	2.04	0.050	BB	14	138.5	5.44	3.93	Basion-Nasion	CC	17	104.7	3.49	3.33	1.15	0.819	0.12	0.906	BB	13	104.6	3.25	3.16	Basion-Nasospinale	CC	14	102.3	3.50	3.42	1.12	0.876	3.76	0.001	BB	11	97.1	3.31	3.41	Basion-Prosthion	CC	13	109.8	4.07	3.71	1.76	0.353	3.16	0.005	BB	11	103.7	5.40	5.21	Bi-Sphenion	CC	15	108.2	5.32	4.91	2.97	0.126	2.38	0.027	BB	9	103.5	3.08	2.98	Glabella-Bregma	CC	17	117.7	5.20	4.42	1.17	0.757	2.00	0.054	BB	15	113.8	5.63	4.94	Nasion-Bregma	CC	17	120.9	5.25	4.34	1.07	0.899	1.91	0.065	BB	16	117.5	5.07	4.32	Metopion height	CC	17	23.0	3.64	15.82	1.49	0.446	4.24	0.000	BB	16	28.0	2.98	10.67	Nasion-Metopion	CC	17	53.8	5.31	9.86	2.53	0.080	0.77	0.449	BB	16	52.6	3.34	6.34	Max. Supraorbital breadth	CC	16	115.9	4.13	3.57	1.05	0.901	1.63	0.116	BB	11	113.2	4.24	3.74	Min. Postorbital breadth	CC	17	99.1	6.12	6.18	1.21	0.732	0.58	0.563	BB	14	100.3	5.55	5.53	Bi-Zygion	CC	6	144.5	3.93	2.73	11.62	0.162	1.18	0.275	BB	3	141.6	1.15	0.81	Bi-Zygomaxillary	CC	12	102.0	4.84	4.75	1.11	1.00	0.08	0.938	BB	5	101.8	4.60	4.52	Nasion-Nasospinale	CC	14	54.2	3.19	5.89	1.55	0.448	2.87	0.008	BB	12	50.2	3.98	7.92	Nasion-Prosthion	CC	13	75.0	2.79	3.73	4.79	0.011	5.77*	0.000	BB	13	64.2	6.12	9.54	Nasospinale-Prosthion	CC	14	20.3	2.79	13.70	1.42	0.541	3.50	0.002	BB	12	16.1	3.32	20.57	Orbital height	CC	15	31.2	2.68	8.59	2.22	0.259	3.69	0.001	BB	9	35.0	1.80	5.15										
Glabella-Lambda	CC	17	192.8	6.95	3.61	1.52	0.449	2.49	0.019																																																																																																																																																																																																																																																																																								
	BB	14	187.0	5.63	3.01					Basion-Bregma	CC	17	142.2	5.16	3.62	1.11	0.828	2.04	0.050	BB	14	138.5	5.44	3.93	Basion-Nasion	CC	17	104.7	3.49	3.33	1.15	0.819	0.12	0.906	BB	13	104.6	3.25	3.16	Basion-Nasospinale	CC	14	102.3	3.50	3.42	1.12	0.876	3.76	0.001	BB	11	97.1	3.31	3.41	Basion-Prosthion	CC	13	109.8	4.07	3.71	1.76	0.353	3.16	0.005	BB	11	103.7	5.40	5.21	Bi-Sphenion	CC	15	108.2	5.32	4.91	2.97	0.126	2.38	0.027	BB	9	103.5	3.08	2.98	Glabella-Bregma	CC	17	117.7	5.20	4.42	1.17	0.757	2.00	0.054	BB	15	113.8	5.63	4.94	Nasion-Bregma	CC	17	120.9	5.25	4.34	1.07	0.899	1.91	0.065	BB	16	117.5	5.07	4.32	Metopion height	CC	17	23.0	3.64	15.82	1.49	0.446	4.24	0.000	BB	16	28.0	2.98	10.67	Nasion-Metopion	CC	17	53.8	5.31	9.86	2.53	0.080	0.77	0.449	BB	16	52.6	3.34	6.34	Max. Supraorbital breadth	CC	16	115.9	4.13	3.57	1.05	0.901	1.63	0.116	BB	11	113.2	4.24	3.74	Min. Postorbital breadth	CC	17	99.1	6.12	6.18	1.21	0.732	0.58	0.563	BB	14	100.3	5.55	5.53	Bi-Zygion	CC	6	144.5	3.93	2.73	11.62	0.162	1.18	0.275	BB	3	141.6	1.15	0.81	Bi-Zygomaxillary	CC	12	102.0	4.84	4.75	1.11	1.00	0.08	0.938	BB	5	101.8	4.60	4.52	Nasion-Nasospinale	CC	14	54.2	3.19	5.89	1.55	0.448	2.87	0.008	BB	12	50.2	3.98	7.92	Nasion-Prosthion	CC	13	75.0	2.79	3.73	4.79	0.011	5.77*	0.000	BB	13	64.2	6.12	9.54	Nasospinale-Prosthion	CC	14	20.3	2.79	13.70	1.42	0.541	3.50	0.002	BB	12	16.1	3.32	20.57	Orbital height	CC	15	31.2	2.68	8.59	2.22	0.259	3.69	0.001	BB	9	35.0	1.80	5.15																									
Basion-Bregma	CC	17	142.2	5.16	3.62	1.11	0.828	2.04	0.050																																																																																																																																																																																																																																																																																								
	BB	14	138.5	5.44	3.93					Basion-Nasion	CC	17	104.7	3.49	3.33	1.15	0.819	0.12	0.906	BB	13	104.6	3.25	3.16	Basion-Nasospinale	CC	14	102.3	3.50	3.42	1.12	0.876	3.76	0.001	BB	11	97.1	3.31	3.41	Basion-Prosthion	CC	13	109.8	4.07	3.71	1.76	0.353	3.16	0.005	BB	11	103.7	5.40	5.21	Bi-Sphenion	CC	15	108.2	5.32	4.91	2.97	0.126	2.38	0.027	BB	9	103.5	3.08	2.98	Glabella-Bregma	CC	17	117.7	5.20	4.42	1.17	0.757	2.00	0.054	BB	15	113.8	5.63	4.94	Nasion-Bregma	CC	17	120.9	5.25	4.34	1.07	0.899	1.91	0.065	BB	16	117.5	5.07	4.32	Metopion height	CC	17	23.0	3.64	15.82	1.49	0.446	4.24	0.000	BB	16	28.0	2.98	10.67	Nasion-Metopion	CC	17	53.8	5.31	9.86	2.53	0.080	0.77	0.449	BB	16	52.6	3.34	6.34	Max. Supraorbital breadth	CC	16	115.9	4.13	3.57	1.05	0.901	1.63	0.116	BB	11	113.2	4.24	3.74	Min. Postorbital breadth	CC	17	99.1	6.12	6.18	1.21	0.732	0.58	0.563	BB	14	100.3	5.55	5.53	Bi-Zygion	CC	6	144.5	3.93	2.73	11.62	0.162	1.18	0.275	BB	3	141.6	1.15	0.81	Bi-Zygomaxillary	CC	12	102.0	4.84	4.75	1.11	1.00	0.08	0.938	BB	5	101.8	4.60	4.52	Nasion-Nasospinale	CC	14	54.2	3.19	5.89	1.55	0.448	2.87	0.008	BB	12	50.2	3.98	7.92	Nasion-Prosthion	CC	13	75.0	2.79	3.73	4.79	0.011	5.77*	0.000	BB	13	64.2	6.12	9.54	Nasospinale-Prosthion	CC	14	20.3	2.79	13.70	1.42	0.541	3.50	0.002	BB	12	16.1	3.32	20.57	Orbital height	CC	15	31.2	2.68	8.59	2.22	0.259	3.69	0.001	BB	9	35.0	1.80	5.15																																								
Basion-Nasion	CC	17	104.7	3.49	3.33	1.15	0.819	0.12	0.906																																																																																																																																																																																																																																																																																								
	BB	13	104.6	3.25	3.16					Basion-Nasospinale	CC	14	102.3	3.50	3.42	1.12	0.876	3.76	0.001	BB	11	97.1	3.31	3.41	Basion-Prosthion	CC	13	109.8	4.07	3.71	1.76	0.353	3.16	0.005	BB	11	103.7	5.40	5.21	Bi-Sphenion	CC	15	108.2	5.32	4.91	2.97	0.126	2.38	0.027	BB	9	103.5	3.08	2.98	Glabella-Bregma	CC	17	117.7	5.20	4.42	1.17	0.757	2.00	0.054	BB	15	113.8	5.63	4.94	Nasion-Bregma	CC	17	120.9	5.25	4.34	1.07	0.899	1.91	0.065	BB	16	117.5	5.07	4.32	Metopion height	CC	17	23.0	3.64	15.82	1.49	0.446	4.24	0.000	BB	16	28.0	2.98	10.67	Nasion-Metopion	CC	17	53.8	5.31	9.86	2.53	0.080	0.77	0.449	BB	16	52.6	3.34	6.34	Max. Supraorbital breadth	CC	16	115.9	4.13	3.57	1.05	0.901	1.63	0.116	BB	11	113.2	4.24	3.74	Min. Postorbital breadth	CC	17	99.1	6.12	6.18	1.21	0.732	0.58	0.563	BB	14	100.3	5.55	5.53	Bi-Zygion	CC	6	144.5	3.93	2.73	11.62	0.162	1.18	0.275	BB	3	141.6	1.15	0.81	Bi-Zygomaxillary	CC	12	102.0	4.84	4.75	1.11	1.00	0.08	0.938	BB	5	101.8	4.60	4.52	Nasion-Nasospinale	CC	14	54.2	3.19	5.89	1.55	0.448	2.87	0.008	BB	12	50.2	3.98	7.92	Nasion-Prosthion	CC	13	75.0	2.79	3.73	4.79	0.011	5.77*	0.000	BB	13	64.2	6.12	9.54	Nasospinale-Prosthion	CC	14	20.3	2.79	13.70	1.42	0.541	3.50	0.002	BB	12	16.1	3.32	20.57	Orbital height	CC	15	31.2	2.68	8.59	2.22	0.259	3.69	0.001	BB	9	35.0	1.80	5.15																																																							
Basion-Nasospinale	CC	14	102.3	3.50	3.42	1.12	0.876	3.76	0.001																																																																																																																																																																																																																																																																																								
	BB	11	97.1	3.31	3.41					Basion-Prosthion	CC	13	109.8	4.07	3.71	1.76	0.353	3.16	0.005	BB	11	103.7	5.40	5.21	Bi-Sphenion	CC	15	108.2	5.32	4.91	2.97	0.126	2.38	0.027	BB	9	103.5	3.08	2.98	Glabella-Bregma	CC	17	117.7	5.20	4.42	1.17	0.757	2.00	0.054	BB	15	113.8	5.63	4.94	Nasion-Bregma	CC	17	120.9	5.25	4.34	1.07	0.899	1.91	0.065	BB	16	117.5	5.07	4.32	Metopion height	CC	17	23.0	3.64	15.82	1.49	0.446	4.24	0.000	BB	16	28.0	2.98	10.67	Nasion-Metopion	CC	17	53.8	5.31	9.86	2.53	0.080	0.77	0.449	BB	16	52.6	3.34	6.34	Max. Supraorbital breadth	CC	16	115.9	4.13	3.57	1.05	0.901	1.63	0.116	BB	11	113.2	4.24	3.74	Min. Postorbital breadth	CC	17	99.1	6.12	6.18	1.21	0.732	0.58	0.563	BB	14	100.3	5.55	5.53	Bi-Zygion	CC	6	144.5	3.93	2.73	11.62	0.162	1.18	0.275	BB	3	141.6	1.15	0.81	Bi-Zygomaxillary	CC	12	102.0	4.84	4.75	1.11	1.00	0.08	0.938	BB	5	101.8	4.60	4.52	Nasion-Nasospinale	CC	14	54.2	3.19	5.89	1.55	0.448	2.87	0.008	BB	12	50.2	3.98	7.92	Nasion-Prosthion	CC	13	75.0	2.79	3.73	4.79	0.011	5.77*	0.000	BB	13	64.2	6.12	9.54	Nasospinale-Prosthion	CC	14	20.3	2.79	13.70	1.42	0.541	3.50	0.002	BB	12	16.1	3.32	20.57	Orbital height	CC	15	31.2	2.68	8.59	2.22	0.259	3.69	0.001	BB	9	35.0	1.80	5.15																																																																						
Basion-Prosthion	CC	13	109.8	4.07	3.71	1.76	0.353	3.16	0.005																																																																																																																																																																																																																																																																																								
	BB	11	103.7	5.40	5.21					Bi-Sphenion	CC	15	108.2	5.32	4.91	2.97	0.126	2.38	0.027	BB	9	103.5	3.08	2.98	Glabella-Bregma	CC	17	117.7	5.20	4.42	1.17	0.757	2.00	0.054	BB	15	113.8	5.63	4.94	Nasion-Bregma	CC	17	120.9	5.25	4.34	1.07	0.899	1.91	0.065	BB	16	117.5	5.07	4.32	Metopion height	CC	17	23.0	3.64	15.82	1.49	0.446	4.24	0.000	BB	16	28.0	2.98	10.67	Nasion-Metopion	CC	17	53.8	5.31	9.86	2.53	0.080	0.77	0.449	BB	16	52.6	3.34	6.34	Max. Supraorbital breadth	CC	16	115.9	4.13	3.57	1.05	0.901	1.63	0.116	BB	11	113.2	4.24	3.74	Min. Postorbital breadth	CC	17	99.1	6.12	6.18	1.21	0.732	0.58	0.563	BB	14	100.3	5.55	5.53	Bi-Zygion	CC	6	144.5	3.93	2.73	11.62	0.162	1.18	0.275	BB	3	141.6	1.15	0.81	Bi-Zygomaxillary	CC	12	102.0	4.84	4.75	1.11	1.00	0.08	0.938	BB	5	101.8	4.60	4.52	Nasion-Nasospinale	CC	14	54.2	3.19	5.89	1.55	0.448	2.87	0.008	BB	12	50.2	3.98	7.92	Nasion-Prosthion	CC	13	75.0	2.79	3.73	4.79	0.011	5.77*	0.000	BB	13	64.2	6.12	9.54	Nasospinale-Prosthion	CC	14	20.3	2.79	13.70	1.42	0.541	3.50	0.002	BB	12	16.1	3.32	20.57	Orbital height	CC	15	31.2	2.68	8.59	2.22	0.259	3.69	0.001	BB	9	35.0	1.80	5.15																																																																																					
Bi-Sphenion	CC	15	108.2	5.32	4.91	2.97	0.126	2.38	0.027																																																																																																																																																																																																																																																																																								
	BB	9	103.5	3.08	2.98					Glabella-Bregma	CC	17	117.7	5.20	4.42	1.17	0.757	2.00	0.054	BB	15	113.8	5.63	4.94	Nasion-Bregma	CC	17	120.9	5.25	4.34	1.07	0.899	1.91	0.065	BB	16	117.5	5.07	4.32	Metopion height	CC	17	23.0	3.64	15.82	1.49	0.446	4.24	0.000	BB	16	28.0	2.98	10.67	Nasion-Metopion	CC	17	53.8	5.31	9.86	2.53	0.080	0.77	0.449	BB	16	52.6	3.34	6.34	Max. Supraorbital breadth	CC	16	115.9	4.13	3.57	1.05	0.901	1.63	0.116	BB	11	113.2	4.24	3.74	Min. Postorbital breadth	CC	17	99.1	6.12	6.18	1.21	0.732	0.58	0.563	BB	14	100.3	5.55	5.53	Bi-Zygion	CC	6	144.5	3.93	2.73	11.62	0.162	1.18	0.275	BB	3	141.6	1.15	0.81	Bi-Zygomaxillary	CC	12	102.0	4.84	4.75	1.11	1.00	0.08	0.938	BB	5	101.8	4.60	4.52	Nasion-Nasospinale	CC	14	54.2	3.19	5.89	1.55	0.448	2.87	0.008	BB	12	50.2	3.98	7.92	Nasion-Prosthion	CC	13	75.0	2.79	3.73	4.79	0.011	5.77*	0.000	BB	13	64.2	6.12	9.54	Nasospinale-Prosthion	CC	14	20.3	2.79	13.70	1.42	0.541	3.50	0.002	BB	12	16.1	3.32	20.57	Orbital height	CC	15	31.2	2.68	8.59	2.22	0.259	3.69	0.001	BB	9	35.0	1.80	5.15																																																																																																				
Glabella-Bregma	CC	17	117.7	5.20	4.42	1.17	0.757	2.00	0.054																																																																																																																																																																																																																																																																																								
	BB	15	113.8	5.63	4.94					Nasion-Bregma	CC	17	120.9	5.25	4.34	1.07	0.899	1.91	0.065	BB	16	117.5	5.07	4.32	Metopion height	CC	17	23.0	3.64	15.82	1.49	0.446	4.24	0.000	BB	16	28.0	2.98	10.67	Nasion-Metopion	CC	17	53.8	5.31	9.86	2.53	0.080	0.77	0.449	BB	16	52.6	3.34	6.34	Max. Supraorbital breadth	CC	16	115.9	4.13	3.57	1.05	0.901	1.63	0.116	BB	11	113.2	4.24	3.74	Min. Postorbital breadth	CC	17	99.1	6.12	6.18	1.21	0.732	0.58	0.563	BB	14	100.3	5.55	5.53	Bi-Zygion	CC	6	144.5	3.93	2.73	11.62	0.162	1.18	0.275	BB	3	141.6	1.15	0.81	Bi-Zygomaxillary	CC	12	102.0	4.84	4.75	1.11	1.00	0.08	0.938	BB	5	101.8	4.60	4.52	Nasion-Nasospinale	CC	14	54.2	3.19	5.89	1.55	0.448	2.87	0.008	BB	12	50.2	3.98	7.92	Nasion-Prosthion	CC	13	75.0	2.79	3.73	4.79	0.011	5.77*	0.000	BB	13	64.2	6.12	9.54	Nasospinale-Prosthion	CC	14	20.3	2.79	13.70	1.42	0.541	3.50	0.002	BB	12	16.1	3.32	20.57	Orbital height	CC	15	31.2	2.68	8.59	2.22	0.259	3.69	0.001	BB	9	35.0	1.80	5.15																																																																																																																			
Nasion-Bregma	CC	17	120.9	5.25	4.34	1.07	0.899	1.91	0.065																																																																																																																																																																																																																																																																																								
	BB	16	117.5	5.07	4.32					Metopion height	CC	17	23.0	3.64	15.82	1.49	0.446	4.24	0.000	BB	16	28.0	2.98	10.67	Nasion-Metopion	CC	17	53.8	5.31	9.86	2.53	0.080	0.77	0.449	BB	16	52.6	3.34	6.34	Max. Supraorbital breadth	CC	16	115.9	4.13	3.57	1.05	0.901	1.63	0.116	BB	11	113.2	4.24	3.74	Min. Postorbital breadth	CC	17	99.1	6.12	6.18	1.21	0.732	0.58	0.563	BB	14	100.3	5.55	5.53	Bi-Zygion	CC	6	144.5	3.93	2.73	11.62	0.162	1.18	0.275	BB	3	141.6	1.15	0.81	Bi-Zygomaxillary	CC	12	102.0	4.84	4.75	1.11	1.00	0.08	0.938	BB	5	101.8	4.60	4.52	Nasion-Nasospinale	CC	14	54.2	3.19	5.89	1.55	0.448	2.87	0.008	BB	12	50.2	3.98	7.92	Nasion-Prosthion	CC	13	75.0	2.79	3.73	4.79	0.011	5.77*	0.000	BB	13	64.2	6.12	9.54	Nasospinale-Prosthion	CC	14	20.3	2.79	13.70	1.42	0.541	3.50	0.002	BB	12	16.1	3.32	20.57	Orbital height	CC	15	31.2	2.68	8.59	2.22	0.259	3.69	0.001	BB	9	35.0	1.80	5.15																																																																																																																																		
Metopion height	CC	17	23.0	3.64	15.82	1.49	0.446	4.24	0.000																																																																																																																																																																																																																																																																																								
	BB	16	28.0	2.98	10.67					Nasion-Metopion	CC	17	53.8	5.31	9.86	2.53	0.080	0.77	0.449	BB	16	52.6	3.34	6.34	Max. Supraorbital breadth	CC	16	115.9	4.13	3.57	1.05	0.901	1.63	0.116	BB	11	113.2	4.24	3.74	Min. Postorbital breadth	CC	17	99.1	6.12	6.18	1.21	0.732	0.58	0.563	BB	14	100.3	5.55	5.53	Bi-Zygion	CC	6	144.5	3.93	2.73	11.62	0.162	1.18	0.275	BB	3	141.6	1.15	0.81	Bi-Zygomaxillary	CC	12	102.0	4.84	4.75	1.11	1.00	0.08	0.938	BB	5	101.8	4.60	4.52	Nasion-Nasospinale	CC	14	54.2	3.19	5.89	1.55	0.448	2.87	0.008	BB	12	50.2	3.98	7.92	Nasion-Prosthion	CC	13	75.0	2.79	3.73	4.79	0.011	5.77*	0.000	BB	13	64.2	6.12	9.54	Nasospinale-Prosthion	CC	14	20.3	2.79	13.70	1.42	0.541	3.50	0.002	BB	12	16.1	3.32	20.57	Orbital height	CC	15	31.2	2.68	8.59	2.22	0.259	3.69	0.001	BB	9	35.0	1.80	5.15																																																																																																																																																	
Nasion-Metopion	CC	17	53.8	5.31	9.86	2.53	0.080	0.77	0.449																																																																																																																																																																																																																																																																																								
	BB	16	52.6	3.34	6.34					Max. Supraorbital breadth	CC	16	115.9	4.13	3.57	1.05	0.901	1.63	0.116	BB	11	113.2	4.24	3.74	Min. Postorbital breadth	CC	17	99.1	6.12	6.18	1.21	0.732	0.58	0.563	BB	14	100.3	5.55	5.53	Bi-Zygion	CC	6	144.5	3.93	2.73	11.62	0.162	1.18	0.275	BB	3	141.6	1.15	0.81	Bi-Zygomaxillary	CC	12	102.0	4.84	4.75	1.11	1.00	0.08	0.938	BB	5	101.8	4.60	4.52	Nasion-Nasospinale	CC	14	54.2	3.19	5.89	1.55	0.448	2.87	0.008	BB	12	50.2	3.98	7.92	Nasion-Prosthion	CC	13	75.0	2.79	3.73	4.79	0.011	5.77*	0.000	BB	13	64.2	6.12	9.54	Nasospinale-Prosthion	CC	14	20.3	2.79	13.70	1.42	0.541	3.50	0.002	BB	12	16.1	3.32	20.57	Orbital height	CC	15	31.2	2.68	8.59	2.22	0.259	3.69	0.001	BB	9	35.0	1.80	5.15																																																																																																																																																																
Max. Supraorbital breadth	CC	16	115.9	4.13	3.57	1.05	0.901	1.63	0.116																																																																																																																																																																																																																																																																																								
	BB	11	113.2	4.24	3.74					Min. Postorbital breadth	CC	17	99.1	6.12	6.18	1.21	0.732	0.58	0.563	BB	14	100.3	5.55	5.53	Bi-Zygion	CC	6	144.5	3.93	2.73	11.62	0.162	1.18	0.275	BB	3	141.6	1.15	0.81	Bi-Zygomaxillary	CC	12	102.0	4.84	4.75	1.11	1.00	0.08	0.938	BB	5	101.8	4.60	4.52	Nasion-Nasospinale	CC	14	54.2	3.19	5.89	1.55	0.448	2.87	0.008	BB	12	50.2	3.98	7.92	Nasion-Prosthion	CC	13	75.0	2.79	3.73	4.79	0.011	5.77*	0.000	BB	13	64.2	6.12	9.54	Nasospinale-Prosthion	CC	14	20.3	2.79	13.70	1.42	0.541	3.50	0.002	BB	12	16.1	3.32	20.57	Orbital height	CC	15	31.2	2.68	8.59	2.22	0.259	3.69	0.001	BB	9	35.0	1.80	5.15																																																																																																																																																																															
Min. Postorbital breadth	CC	17	99.1	6.12	6.18	1.21	0.732	0.58	0.563																																																																																																																																																																																																																																																																																								
	BB	14	100.3	5.55	5.53					Bi-Zygion	CC	6	144.5	3.93	2.73	11.62	0.162	1.18	0.275	BB	3	141.6	1.15	0.81	Bi-Zygomaxillary	CC	12	102.0	4.84	4.75	1.11	1.00	0.08	0.938	BB	5	101.8	4.60	4.52	Nasion-Nasospinale	CC	14	54.2	3.19	5.89	1.55	0.448	2.87	0.008	BB	12	50.2	3.98	7.92	Nasion-Prosthion	CC	13	75.0	2.79	3.73	4.79	0.011	5.77*	0.000	BB	13	64.2	6.12	9.54	Nasospinale-Prosthion	CC	14	20.3	2.79	13.70	1.42	0.541	3.50	0.002	BB	12	16.1	3.32	20.57	Orbital height	CC	15	31.2	2.68	8.59	2.22	0.259	3.69	0.001	BB	9	35.0	1.80	5.15																																																																																																																																																																																														
Bi-Zygion	CC	6	144.5	3.93	2.73	11.62	0.162	1.18	0.275																																																																																																																																																																																																																																																																																								
	BB	3	141.6	1.15	0.81					Bi-Zygomaxillary	CC	12	102.0	4.84	4.75	1.11	1.00	0.08	0.938	BB	5	101.8	4.60	4.52	Nasion-Nasospinale	CC	14	54.2	3.19	5.89	1.55	0.448	2.87	0.008	BB	12	50.2	3.98	7.92	Nasion-Prosthion	CC	13	75.0	2.79	3.73	4.79	0.011	5.77*	0.000	BB	13	64.2	6.12	9.54	Nasospinale-Prosthion	CC	14	20.3	2.79	13.70	1.42	0.541	3.50	0.002	BB	12	16.1	3.32	20.57	Orbital height	CC	15	31.2	2.68	8.59	2.22	0.259	3.69	0.001	BB	9	35.0	1.80	5.15																																																																																																																																																																																																													
Bi-Zygomaxillary	CC	12	102.0	4.84	4.75	1.11	1.00	0.08	0.938																																																																																																																																																																																																																																																																																								
	BB	5	101.8	4.60	4.52					Nasion-Nasospinale	CC	14	54.2	3.19	5.89	1.55	0.448	2.87	0.008	BB	12	50.2	3.98	7.92	Nasion-Prosthion	CC	13	75.0	2.79	3.73	4.79	0.011	5.77*	0.000	BB	13	64.2	6.12	9.54	Nasospinale-Prosthion	CC	14	20.3	2.79	13.70	1.42	0.541	3.50	0.002	BB	12	16.1	3.32	20.57	Orbital height	CC	15	31.2	2.68	8.59	2.22	0.259	3.69	0.001	BB	9	35.0	1.80	5.15																																																																																																																																																																																																																												
Nasion-Nasospinale	CC	14	54.2	3.19	5.89	1.55	0.448	2.87	0.008																																																																																																																																																																																																																																																																																								
	BB	12	50.2	3.98	7.92					Nasion-Prosthion	CC	13	75.0	2.79	3.73	4.79	0.011	5.77*	0.000	BB	13	64.2	6.12	9.54	Nasospinale-Prosthion	CC	14	20.3	2.79	13.70	1.42	0.541	3.50	0.002	BB	12	16.1	3.32	20.57	Orbital height	CC	15	31.2	2.68	8.59	2.22	0.259	3.69	0.001	BB	9	35.0	1.80	5.15																																																																																																																																																																																																																																											
Nasion-Prosthion	CC	13	75.0	2.79	3.73	4.79	0.011	5.77*	0.000																																																																																																																																																																																																																																																																																								
	BB	13	64.2	6.12	9.54					Nasospinale-Prosthion	CC	14	20.3	2.79	13.70	1.42	0.541	3.50	0.002	BB	12	16.1	3.32	20.57	Orbital height	CC	15	31.2	2.68	8.59	2.22	0.259	3.69	0.001	BB	9	35.0	1.80	5.15																																																																																																																																																																																																																																																										
Nasospinale-Prosthion	CC	14	20.3	2.79	13.70	1.42	0.541	3.50	0.002																																																																																																																																																																																																																																																																																								
	BB	12	16.1	3.32	20.57					Orbital height	CC	15	31.2	2.68	8.59	2.22	0.259	3.69	0.001	BB	9	35.0	1.80	5.15																																																																																																																																																																																																																																																																									
Orbital height	CC	15	31.2	2.68	8.59	2.22	0.259	3.69	0.001																																																																																																																																																																																																																																																																																								
	BB	9	35.0	1.80	5.15																																																																																																																																																																																																																																																																																												

*T calculated using separate variance estimate

		n	\bar{X}	s	CV	F	P	T	P
Bi-Ectoconchion	CC	13	108.6	3.52	3.24				
	BB	5	108.4	3.64	3.36	1.07	0.824	0.16	0.878
Alveolar length	CC	14	64.9	2.64	4.07				
	BB	15	61.1	3.18	5.21	1.45	0.512	3.48	0.002
Alveolar breadth	CC	14	73.2	3.77	5.15				
	BB	14	67.7	3.83	5.66	1.03	0.955	3.88	0.001
Mastoid depth	CC	17	31.5	2.93	9.32				
	BB	14	30.2	2.29	7.59	1.64	0.372	1.37	0.183

Table 53

Comparative statistics for the Murray Valley (MV) and Swanport (SW) male crania (mm.)

		n	\bar{X}	s	CV	F	P	T	P																																																																																																																																																																																																																																																																																								
Max. Bi-Parietal breadth	MV	46	130.5	4.52	3.46	2.37	0.032	0.70*	0.489																																																																																																																																																																																																																																																																																								
	SW	23	129.9	2.93	2.26					Glabella-Opisthocranium	MV	47	184.2	5.75	3.04	1.17	0.713	0.02	0.986	SW	23	189.1	5.33	2.82	Glabella-Lambda	MV	47	184.2	5.75	3.12	1.19	0.675	1.49	0.141	SW	23	182.1	5.28	2.90	Basion-Bregma	MV	45	133.4	4.04	3.03	1.42	0.322	4.04	0.000	SW	22	128.9	4.82	3.74	Basion-Nasion	MV	45	102.4	3.28	3.21	1.14	0.688	1.23	0.221	SW	22	101.4	3.51	3.46	Basion-Nasospinale	MV	45	99.0	3.88	3.92	1.01	0.938	0.04	0.964	SW	22	99.0	3.90	3.95	Basion-Prosthion	MV	45	106.5	4.37	4.11	1.19	0.617	1.69	0.096	SW	21	104.5	4.77	4.56	Basion-Lambda	MV	45	114.2	2.83	2.48	4.71	0.000	2.34*	0.030	SW	17	110.5	6.15	5.56	Basion-Inion	MV	43	81.5	4.93	6.05	2.23	0.084	7.17	0.000	SW	17	72.1	3.30	4.57	Bi-Auriculare	MV	47	121.2	4.23	3.49	1.19	0.734	0.60	0.548	SW	17	120.5	3.89	3.22	Bi-Asterion	MV	44	111.4	3.84	3.45	1.26	0.626	1.73	0.088	SW	18	109.6	3.43	3.13	Bi-Sphenion	MV	45	103.6	3.77	3.64	1.11	0.740	2.19	0.032	SW	22	101.4	3.98	3.93	Glabella-Bregma	MV	47	109.9	4.38	3.99	1.63	0.215	0.61	0.547	SW	23	109.3	3.43	3.14	Nasion-Bregma	MV	47	113.4	4.28	3.77	1.86	0.117	1.16	0.251	SW	23	112.3	3.14	2.79	Metopion height	MV	47	25.6	2.20	8.61	1.06	0.850	0.86	0.395	SW	23	25.1	2.26	9.01	Nasion-Metopion	MV	47	51.0	3.34	6.56	1.29	0.530	1.38	0.173	SW	23	49.9	2.95	5.92	Max. Supraorbital breadth	MV	47	108.5	3.48	3.20	1.17	0.635	1.35	0.182	SW	23	109.7	3.76	3.43	Max. Posterior Frontal br.	MV	16	110.7	3.13	2.83	2.43	0.153	0.23	0.818	SW	7	111.1	4.88	4.39	Min. Postorbital br.	MV	47	95.4	4.60	4.82	1.26	0.563	0.07	0.947	SW	23	95.5	4.09	4.29	Min. Bi-Temporal lines	MV	47	87.0	7.83	9.00	1.83	0.106	0.44	0.662
Glabella-Opisthocranium	MV	47	184.2	5.75	3.04	1.17	0.713	0.02	0.986																																																																																																																																																																																																																																																																																								
	SW	23	189.1	5.33	2.82					Glabella-Lambda	MV	47	184.2	5.75	3.12	1.19	0.675	1.49	0.141	SW	23	182.1	5.28	2.90	Basion-Bregma	MV	45	133.4	4.04	3.03	1.42	0.322	4.04	0.000	SW	22	128.9	4.82	3.74	Basion-Nasion	MV	45	102.4	3.28	3.21	1.14	0.688	1.23	0.221	SW	22	101.4	3.51	3.46	Basion-Nasospinale	MV	45	99.0	3.88	3.92	1.01	0.938	0.04	0.964	SW	22	99.0	3.90	3.95	Basion-Prosthion	MV	45	106.5	4.37	4.11	1.19	0.617	1.69	0.096	SW	21	104.5	4.77	4.56	Basion-Lambda	MV	45	114.2	2.83	2.48	4.71	0.000	2.34*	0.030	SW	17	110.5	6.15	5.56	Basion-Inion	MV	43	81.5	4.93	6.05	2.23	0.084	7.17	0.000	SW	17	72.1	3.30	4.57	Bi-Auriculare	MV	47	121.2	4.23	3.49	1.19	0.734	0.60	0.548	SW	17	120.5	3.89	3.22	Bi-Asterion	MV	44	111.4	3.84	3.45	1.26	0.626	1.73	0.088	SW	18	109.6	3.43	3.13	Bi-Sphenion	MV	45	103.6	3.77	3.64	1.11	0.740	2.19	0.032	SW	22	101.4	3.98	3.93	Glabella-Bregma	MV	47	109.9	4.38	3.99	1.63	0.215	0.61	0.547	SW	23	109.3	3.43	3.14	Nasion-Bregma	MV	47	113.4	4.28	3.77	1.86	0.117	1.16	0.251	SW	23	112.3	3.14	2.79	Metopion height	MV	47	25.6	2.20	8.61	1.06	0.850	0.86	0.395	SW	23	25.1	2.26	9.01	Nasion-Metopion	MV	47	51.0	3.34	6.56	1.29	0.530	1.38	0.173	SW	23	49.9	2.95	5.92	Max. Supraorbital breadth	MV	47	108.5	3.48	3.20	1.17	0.635	1.35	0.182	SW	23	109.7	3.76	3.43	Max. Posterior Frontal br.	MV	16	110.7	3.13	2.83	2.43	0.153	0.23	0.818	SW	7	111.1	4.88	4.39	Min. Postorbital br.	MV	47	95.4	4.60	4.82	1.26	0.563	0.07	0.947	SW	23	95.5	4.09	4.29	Min. Bi-Temporal lines	MV	47	87.0	7.83	9.00	1.83	0.106	0.44	0.662	SW	18	85.9	10.6	12.34										
Glabella-Lambda	MV	47	184.2	5.75	3.12	1.19	0.675	1.49	0.141																																																																																																																																																																																																																																																																																								
	SW	23	182.1	5.28	2.90					Basion-Bregma	MV	45	133.4	4.04	3.03	1.42	0.322	4.04	0.000	SW	22	128.9	4.82	3.74	Basion-Nasion	MV	45	102.4	3.28	3.21	1.14	0.688	1.23	0.221	SW	22	101.4	3.51	3.46	Basion-Nasospinale	MV	45	99.0	3.88	3.92	1.01	0.938	0.04	0.964	SW	22	99.0	3.90	3.95	Basion-Prosthion	MV	45	106.5	4.37	4.11	1.19	0.617	1.69	0.096	SW	21	104.5	4.77	4.56	Basion-Lambda	MV	45	114.2	2.83	2.48	4.71	0.000	2.34*	0.030	SW	17	110.5	6.15	5.56	Basion-Inion	MV	43	81.5	4.93	6.05	2.23	0.084	7.17	0.000	SW	17	72.1	3.30	4.57	Bi-Auriculare	MV	47	121.2	4.23	3.49	1.19	0.734	0.60	0.548	SW	17	120.5	3.89	3.22	Bi-Asterion	MV	44	111.4	3.84	3.45	1.26	0.626	1.73	0.088	SW	18	109.6	3.43	3.13	Bi-Sphenion	MV	45	103.6	3.77	3.64	1.11	0.740	2.19	0.032	SW	22	101.4	3.98	3.93	Glabella-Bregma	MV	47	109.9	4.38	3.99	1.63	0.215	0.61	0.547	SW	23	109.3	3.43	3.14	Nasion-Bregma	MV	47	113.4	4.28	3.77	1.86	0.117	1.16	0.251	SW	23	112.3	3.14	2.79	Metopion height	MV	47	25.6	2.20	8.61	1.06	0.850	0.86	0.395	SW	23	25.1	2.26	9.01	Nasion-Metopion	MV	47	51.0	3.34	6.56	1.29	0.530	1.38	0.173	SW	23	49.9	2.95	5.92	Max. Supraorbital breadth	MV	47	108.5	3.48	3.20	1.17	0.635	1.35	0.182	SW	23	109.7	3.76	3.43	Max. Posterior Frontal br.	MV	16	110.7	3.13	2.83	2.43	0.153	0.23	0.818	SW	7	111.1	4.88	4.39	Min. Postorbital br.	MV	47	95.4	4.60	4.82	1.26	0.563	0.07	0.947	SW	23	95.5	4.09	4.29	Min. Bi-Temporal lines	MV	47	87.0	7.83	9.00	1.83	0.106	0.44	0.662	SW	18	85.9	10.6	12.34																									
Basion-Bregma	MV	45	133.4	4.04	3.03	1.42	0.322	4.04	0.000																																																																																																																																																																																																																																																																																								
	SW	22	128.9	4.82	3.74					Basion-Nasion	MV	45	102.4	3.28	3.21	1.14	0.688	1.23	0.221	SW	22	101.4	3.51	3.46	Basion-Nasospinale	MV	45	99.0	3.88	3.92	1.01	0.938	0.04	0.964	SW	22	99.0	3.90	3.95	Basion-Prosthion	MV	45	106.5	4.37	4.11	1.19	0.617	1.69	0.096	SW	21	104.5	4.77	4.56	Basion-Lambda	MV	45	114.2	2.83	2.48	4.71	0.000	2.34*	0.030	SW	17	110.5	6.15	5.56	Basion-Inion	MV	43	81.5	4.93	6.05	2.23	0.084	7.17	0.000	SW	17	72.1	3.30	4.57	Bi-Auriculare	MV	47	121.2	4.23	3.49	1.19	0.734	0.60	0.548	SW	17	120.5	3.89	3.22	Bi-Asterion	MV	44	111.4	3.84	3.45	1.26	0.626	1.73	0.088	SW	18	109.6	3.43	3.13	Bi-Sphenion	MV	45	103.6	3.77	3.64	1.11	0.740	2.19	0.032	SW	22	101.4	3.98	3.93	Glabella-Bregma	MV	47	109.9	4.38	3.99	1.63	0.215	0.61	0.547	SW	23	109.3	3.43	3.14	Nasion-Bregma	MV	47	113.4	4.28	3.77	1.86	0.117	1.16	0.251	SW	23	112.3	3.14	2.79	Metopion height	MV	47	25.6	2.20	8.61	1.06	0.850	0.86	0.395	SW	23	25.1	2.26	9.01	Nasion-Metopion	MV	47	51.0	3.34	6.56	1.29	0.530	1.38	0.173	SW	23	49.9	2.95	5.92	Max. Supraorbital breadth	MV	47	108.5	3.48	3.20	1.17	0.635	1.35	0.182	SW	23	109.7	3.76	3.43	Max. Posterior Frontal br.	MV	16	110.7	3.13	2.83	2.43	0.153	0.23	0.818	SW	7	111.1	4.88	4.39	Min. Postorbital br.	MV	47	95.4	4.60	4.82	1.26	0.563	0.07	0.947	SW	23	95.5	4.09	4.29	Min. Bi-Temporal lines	MV	47	87.0	7.83	9.00	1.83	0.106	0.44	0.662	SW	18	85.9	10.6	12.34																																								
Basion-Nasion	MV	45	102.4	3.28	3.21	1.14	0.688	1.23	0.221																																																																																																																																																																																																																																																																																								
	SW	22	101.4	3.51	3.46					Basion-Nasospinale	MV	45	99.0	3.88	3.92	1.01	0.938	0.04	0.964	SW	22	99.0	3.90	3.95	Basion-Prosthion	MV	45	106.5	4.37	4.11	1.19	0.617	1.69	0.096	SW	21	104.5	4.77	4.56	Basion-Lambda	MV	45	114.2	2.83	2.48	4.71	0.000	2.34*	0.030	SW	17	110.5	6.15	5.56	Basion-Inion	MV	43	81.5	4.93	6.05	2.23	0.084	7.17	0.000	SW	17	72.1	3.30	4.57	Bi-Auriculare	MV	47	121.2	4.23	3.49	1.19	0.734	0.60	0.548	SW	17	120.5	3.89	3.22	Bi-Asterion	MV	44	111.4	3.84	3.45	1.26	0.626	1.73	0.088	SW	18	109.6	3.43	3.13	Bi-Sphenion	MV	45	103.6	3.77	3.64	1.11	0.740	2.19	0.032	SW	22	101.4	3.98	3.93	Glabella-Bregma	MV	47	109.9	4.38	3.99	1.63	0.215	0.61	0.547	SW	23	109.3	3.43	3.14	Nasion-Bregma	MV	47	113.4	4.28	3.77	1.86	0.117	1.16	0.251	SW	23	112.3	3.14	2.79	Metopion height	MV	47	25.6	2.20	8.61	1.06	0.850	0.86	0.395	SW	23	25.1	2.26	9.01	Nasion-Metopion	MV	47	51.0	3.34	6.56	1.29	0.530	1.38	0.173	SW	23	49.9	2.95	5.92	Max. Supraorbital breadth	MV	47	108.5	3.48	3.20	1.17	0.635	1.35	0.182	SW	23	109.7	3.76	3.43	Max. Posterior Frontal br.	MV	16	110.7	3.13	2.83	2.43	0.153	0.23	0.818	SW	7	111.1	4.88	4.39	Min. Postorbital br.	MV	47	95.4	4.60	4.82	1.26	0.563	0.07	0.947	SW	23	95.5	4.09	4.29	Min. Bi-Temporal lines	MV	47	87.0	7.83	9.00	1.83	0.106	0.44	0.662	SW	18	85.9	10.6	12.34																																																							
Basion-Nasospinale	MV	45	99.0	3.88	3.92	1.01	0.938	0.04	0.964																																																																																																																																																																																																																																																																																								
	SW	22	99.0	3.90	3.95					Basion-Prosthion	MV	45	106.5	4.37	4.11	1.19	0.617	1.69	0.096	SW	21	104.5	4.77	4.56	Basion-Lambda	MV	45	114.2	2.83	2.48	4.71	0.000	2.34*	0.030	SW	17	110.5	6.15	5.56	Basion-Inion	MV	43	81.5	4.93	6.05	2.23	0.084	7.17	0.000	SW	17	72.1	3.30	4.57	Bi-Auriculare	MV	47	121.2	4.23	3.49	1.19	0.734	0.60	0.548	SW	17	120.5	3.89	3.22	Bi-Asterion	MV	44	111.4	3.84	3.45	1.26	0.626	1.73	0.088	SW	18	109.6	3.43	3.13	Bi-Sphenion	MV	45	103.6	3.77	3.64	1.11	0.740	2.19	0.032	SW	22	101.4	3.98	3.93	Glabella-Bregma	MV	47	109.9	4.38	3.99	1.63	0.215	0.61	0.547	SW	23	109.3	3.43	3.14	Nasion-Bregma	MV	47	113.4	4.28	3.77	1.86	0.117	1.16	0.251	SW	23	112.3	3.14	2.79	Metopion height	MV	47	25.6	2.20	8.61	1.06	0.850	0.86	0.395	SW	23	25.1	2.26	9.01	Nasion-Metopion	MV	47	51.0	3.34	6.56	1.29	0.530	1.38	0.173	SW	23	49.9	2.95	5.92	Max. Supraorbital breadth	MV	47	108.5	3.48	3.20	1.17	0.635	1.35	0.182	SW	23	109.7	3.76	3.43	Max. Posterior Frontal br.	MV	16	110.7	3.13	2.83	2.43	0.153	0.23	0.818	SW	7	111.1	4.88	4.39	Min. Postorbital br.	MV	47	95.4	4.60	4.82	1.26	0.563	0.07	0.947	SW	23	95.5	4.09	4.29	Min. Bi-Temporal lines	MV	47	87.0	7.83	9.00	1.83	0.106	0.44	0.662	SW	18	85.9	10.6	12.34																																																																						
Basion-Prosthion	MV	45	106.5	4.37	4.11	1.19	0.617	1.69	0.096																																																																																																																																																																																																																																																																																								
	SW	21	104.5	4.77	4.56					Basion-Lambda	MV	45	114.2	2.83	2.48	4.71	0.000	2.34*	0.030	SW	17	110.5	6.15	5.56	Basion-Inion	MV	43	81.5	4.93	6.05	2.23	0.084	7.17	0.000	SW	17	72.1	3.30	4.57	Bi-Auriculare	MV	47	121.2	4.23	3.49	1.19	0.734	0.60	0.548	SW	17	120.5	3.89	3.22	Bi-Asterion	MV	44	111.4	3.84	3.45	1.26	0.626	1.73	0.088	SW	18	109.6	3.43	3.13	Bi-Sphenion	MV	45	103.6	3.77	3.64	1.11	0.740	2.19	0.032	SW	22	101.4	3.98	3.93	Glabella-Bregma	MV	47	109.9	4.38	3.99	1.63	0.215	0.61	0.547	SW	23	109.3	3.43	3.14	Nasion-Bregma	MV	47	113.4	4.28	3.77	1.86	0.117	1.16	0.251	SW	23	112.3	3.14	2.79	Metopion height	MV	47	25.6	2.20	8.61	1.06	0.850	0.86	0.395	SW	23	25.1	2.26	9.01	Nasion-Metopion	MV	47	51.0	3.34	6.56	1.29	0.530	1.38	0.173	SW	23	49.9	2.95	5.92	Max. Supraorbital breadth	MV	47	108.5	3.48	3.20	1.17	0.635	1.35	0.182	SW	23	109.7	3.76	3.43	Max. Posterior Frontal br.	MV	16	110.7	3.13	2.83	2.43	0.153	0.23	0.818	SW	7	111.1	4.88	4.39	Min. Postorbital br.	MV	47	95.4	4.60	4.82	1.26	0.563	0.07	0.947	SW	23	95.5	4.09	4.29	Min. Bi-Temporal lines	MV	47	87.0	7.83	9.00	1.83	0.106	0.44	0.662	SW	18	85.9	10.6	12.34																																																																																					
Basion-Lambda	MV	45	114.2	2.83	2.48	4.71	0.000	2.34*	0.030																																																																																																																																																																																																																																																																																								
	SW	17	110.5	6.15	5.56					Basion-Inion	MV	43	81.5	4.93	6.05	2.23	0.084	7.17	0.000	SW	17	72.1	3.30	4.57	Bi-Auriculare	MV	47	121.2	4.23	3.49	1.19	0.734	0.60	0.548	SW	17	120.5	3.89	3.22	Bi-Asterion	MV	44	111.4	3.84	3.45	1.26	0.626	1.73	0.088	SW	18	109.6	3.43	3.13	Bi-Sphenion	MV	45	103.6	3.77	3.64	1.11	0.740	2.19	0.032	SW	22	101.4	3.98	3.93	Glabella-Bregma	MV	47	109.9	4.38	3.99	1.63	0.215	0.61	0.547	SW	23	109.3	3.43	3.14	Nasion-Bregma	MV	47	113.4	4.28	3.77	1.86	0.117	1.16	0.251	SW	23	112.3	3.14	2.79	Metopion height	MV	47	25.6	2.20	8.61	1.06	0.850	0.86	0.395	SW	23	25.1	2.26	9.01	Nasion-Metopion	MV	47	51.0	3.34	6.56	1.29	0.530	1.38	0.173	SW	23	49.9	2.95	5.92	Max. Supraorbital breadth	MV	47	108.5	3.48	3.20	1.17	0.635	1.35	0.182	SW	23	109.7	3.76	3.43	Max. Posterior Frontal br.	MV	16	110.7	3.13	2.83	2.43	0.153	0.23	0.818	SW	7	111.1	4.88	4.39	Min. Postorbital br.	MV	47	95.4	4.60	4.82	1.26	0.563	0.07	0.947	SW	23	95.5	4.09	4.29	Min. Bi-Temporal lines	MV	47	87.0	7.83	9.00	1.83	0.106	0.44	0.662	SW	18	85.9	10.6	12.34																																																																																																				
Basion-Inion	MV	43	81.5	4.93	6.05	2.23	0.084	7.17	0.000																																																																																																																																																																																																																																																																																								
	SW	17	72.1	3.30	4.57					Bi-Auriculare	MV	47	121.2	4.23	3.49	1.19	0.734	0.60	0.548	SW	17	120.5	3.89	3.22	Bi-Asterion	MV	44	111.4	3.84	3.45	1.26	0.626	1.73	0.088	SW	18	109.6	3.43	3.13	Bi-Sphenion	MV	45	103.6	3.77	3.64	1.11	0.740	2.19	0.032	SW	22	101.4	3.98	3.93	Glabella-Bregma	MV	47	109.9	4.38	3.99	1.63	0.215	0.61	0.547	SW	23	109.3	3.43	3.14	Nasion-Bregma	MV	47	113.4	4.28	3.77	1.86	0.117	1.16	0.251	SW	23	112.3	3.14	2.79	Metopion height	MV	47	25.6	2.20	8.61	1.06	0.850	0.86	0.395	SW	23	25.1	2.26	9.01	Nasion-Metopion	MV	47	51.0	3.34	6.56	1.29	0.530	1.38	0.173	SW	23	49.9	2.95	5.92	Max. Supraorbital breadth	MV	47	108.5	3.48	3.20	1.17	0.635	1.35	0.182	SW	23	109.7	3.76	3.43	Max. Posterior Frontal br.	MV	16	110.7	3.13	2.83	2.43	0.153	0.23	0.818	SW	7	111.1	4.88	4.39	Min. Postorbital br.	MV	47	95.4	4.60	4.82	1.26	0.563	0.07	0.947	SW	23	95.5	4.09	4.29	Min. Bi-Temporal lines	MV	47	87.0	7.83	9.00	1.83	0.106	0.44	0.662	SW	18	85.9	10.6	12.34																																																																																																																			
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Max. Supraorbital breadth	MV	47	108.5	3.48	3.20	1.17	0.635	1.35	0.182																																																																																																																																																																																																																																																																																								
	SW	23	109.7	3.76	3.43					Max. Posterior Frontal br.	MV	16	110.7	3.13	2.83	2.43	0.153	0.23	0.818	SW	7	111.1	4.88	4.39	Min. Postorbital br.	MV	47	95.4	4.60	4.82	1.26	0.563	0.07	0.947	SW	23	95.5	4.09	4.29	Min. Bi-Temporal lines	MV	47	87.0	7.83	9.00	1.83	0.106	0.44	0.662	SW	18	85.9	10.6	12.34																																																																																																																																																																																																																																											
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Min. Postorbital br.	MV	47	95.4	4.60	4.82	1.26	0.563	0.07	0.947																																																																																																																																																																																																																																																																																								
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	SW	18	85.9	10.6	12.34																																																																																																																																																																																																																																																																																												

*T calculated using separate variance estimate

		n	\bar{X}	s	CV	F	P	T	P
Bi-Zygion	MV	44	135.5	5.00	3.69				
	SW	18	136.8	3.02	2.21	2.74	0.027	1.27*	0.209
Bi-Zygomaxillary	MV	47	94.4	4.18	4.42				
	SW	23	96.8	4.02	4.15	1.08	0.874	2.28	0.025
Bi-Stephanion	MV	47	92.1	7.62	8.28				
	SW	18	92.7	10.04	10.83	1.73	0.141	0.27	0.791
Bi-Stenionic	MV	47	71.8	3.78	5.29				
	SW	16	71.5	3.20	4.48	1.40	0.488	0.33	0.741
Opisthion-Inion	MV	45	47.4	4.86	10.24				
	SW	18	37.7	4.26	11.29	1.30	0.566	7.40	0.000
Opisthion-Lambda	MV	46	94.5	3.48	3.69				
	SW	18	92.6	3.66	3.96	1.10	0.760	1.97	0.054
Opisthion-Asterion	MV	46	65.9	3.05	4.64				
	SW	18	62.6	3.19	5.10	1.09	0.777	3.85	0.000
Opisthion-Glabella	MV	44	145.5	5.16	3.54				
	SW	18	143.8	4.88	3.39	1.12	0.837	1.18	0.242
Basion-Asterion	MV	45	77.8	3.78	4.86				
	SW	17	75.2	3.72	4.94	1.03	0.990	2.34	0.023
Basion-Mastoidale	MV	44	52.3	2.83	5.40				
	SW	17	53.4	2.55	4.77	1.23	0.671	1.30	0.198
Basion-Staphylion	MV	44	47.7	2.49	5.22				
	SW	17	47.8	3.23	6.76	1.69	0.172	0.20	0.842
Lambda-Bregma	MV	46	117.3	5.04	4.30				
	SW	18	114.2	4.68	4.10	1.16	0.786	2.26	0.027
Lambda-Inion	MV	47	61.1	5.25	8.59				
	SW	17	66.6	5.53	8.30	1.11	0.750	3.65	0.001
Lambda-Asterion	MV	47	82.3	3.57	4.34				
	SW	18	83.1	3.14	3.78	1.30	0.571	0.78	0.438
Auriculare-Zygomaxillary	MV	47	78.4	4.11	5.24				
	SW	18	76.8	2.65	3.45	2.40	0.052	1.77*	0.083
Auriculare-Opisthion	MV	46	77.0	3.00	3.89				
	SW	18	75.2	4.52	6.00	2.27	0.029	1.57*	0.131
Auriculare-Basion	MV	45	66.1	3.14	4.75				
	SW	17	66.8	6.45	9.65	4.21	0.000	0.43*	0.671
Nasion-Nasospinale	MV	47	49.9	2.66	5.33				
	SW	23	51.4	2.25	4.38	1.39	0.402	2.36	0.021
Nasion-Prosthion	MV	47	70.5	3.911	5.54				
	SW	22	67.6	2.88	4.26	1.83	0.133	3.14	0.003
Nasospinale-Prosthion	MV	47	20.7	2.85	13.77				
	SW	22	16.0	2.51	15.68	1.28	0.543	6.55	0.000

*T calculated using separate variance estimate

		n	\bar{X}	s	CV	F	P	T	P
Nasal breadth	MV	47	28.3	2.07	7.33				
	SW	18	26.5	1.46	5.53	2.01	0.117	3.47	0.001
Orbital height	MV	47	32.9	2.50	7.61				
	SW	23	34.2	2.29	6.70	1.19	0.670	2.06	0.043
Orbital breadth	MV	47	44.5	1.97	4.44				
	SW	18	43.8	1.29	2.95	2.33	0.060	1.71*	0.093
Bi-Ectoconchion	MV	46	104.3	3.48	3.35				
	SW	21	103.6	3.46	3.35	1.01	1.000	0.70	0.489
Frontal arc	MV	46	130.2	5.59	4.29				
	SW	18	128.3	4.73	0.87	1.40	0.458	1.25	0.215
Parietal arc	MV	42	130.1	6.14	4.72				
	SW	18	126.2	5.67	4.49	1.17	0.746	2.33	0.023
Occipital arc	MV	43	113.6	4.95	4.36				
	SW	18	113.3	5.95	5.25	1.44	0.329	0.22	0.830
Alveolar length	MV	47	64.1	3.98	6.20				
	SW	23	61.6	3.29	5.35	1.46	0.342	2.69	0.009
Alveolar breadth	MV	47	69.3	3.55	5.12				
	SW	23	66.6	2.77	4.17	1.64	0.212	3.21	0.002
Mastoid depth	MV	47	31.2	2.35	7.55				
	SW	22	29.2	2.81	9.61	1.42	0.318	3.06	0.003
Bi-Canine breadth	MV	47	46.5	2.33	5.01				
	SW	15	46.0	1.85	4.03	1.58	0.351	0.77	0.443
Parietal Subtense height	MV	44	23.3	1.93	8.31				
	SW	18	22.6	2.72	12.01	1.97	0.073	1.06	0.292
Bregma-Parietal Subtense	MV	44	59.5	4.63	7.78				
	SW	18	59.1	4.13	6.98	1.26	0.625	0.30	0.764

Table 54

Comparative statistics for the Murray Valley (MV) and Broadbeach (BB) male crania (mm.)

		n	\bar{X}	s	CV	F	P	T	P																																																																																																																																																																																																																																																																																								
Max. Bi-Parietal breadth	MV	46	130.5	4.52	3.46	1.00	1.000	0.74	0.464																																																																																																																																																																																																																																																																																								
	BB	15	131.5	4.51	3.43					Glabella-Opisthocranion	MV	47	189.1	5.75	3.04	1.35	0.573	1.97	0.054	BB	14	192.5	4.95	2.57	Glabella-Lambda	MV	47	184.2	5.75	3.12	1.04	0.992	1.59	0.117	BB	14	187.0	5.63	3.01	Basion-Bregma	MV	45	133.4	4.04	3.03	1.81	0.144	3.77	0.000	BB	14	138.5	5.44	3.93	Basion-Nasion	MV	45	102.4	3.28	3.21	1.02	1.000	2.06	0.044	BB	13	104.6	3.25	3.16	Basion-Nasospinale	MV	45	99.0	3.88	3.92	1.38	0.609	1.43	0.159	BB	11	97.1	3.31	3.41	Basion-Prosthion	MV	45	106.5	4.37	4.11	1.52	0.326	1.82	0.074	BB	11	103.7	5.40	5.21	Bi-Sphenion	MV	45	103.6	3.77	3.64	1.50	0.568	0.03	0.974	BB	9	103.5	3.08	2.98	Glabella-Bregma	MV	47	109.9	4.38	3.99	1.65	0.202	2.82	0.007	BB	15	113.8	5.63	4.94	Nasion-Bregma	MV	47	113.4	4.28	3.77	1.40	0.373	3.10	0.003	BB	16	117.5	5.07	4.32	Metopion height	MV	47	25.6	2.20	8.61	1.83	0.118	3.34	0.001	BB	16	28.0	2.98	10.67	Nasion-Metopion	MV	47	51.0	3.34	6.56	1.00	1.000	1.70	0.095	BB	16	52.6	3.34	6.34	Max. Supraorbital breadth	MV	47	108.5	3.48	3.20	1.49	0.351	3.92	0.000	BB	11	113.2	4.24	3.74	Max. Posterior Frontal br.	MV	16	110.7	3.13	2.83	3.36	0.347	4.26	0.000	BB	4	117.7	1.70	1.45	Min. Postorbital breadth	MV	47	95.4	4.60	4.82	1.45	0.344	3.31	0.002	BB	14	100.3	5.55	5.53	Bi-Zygion	MV	44	135.5	5.50	3.69	18.82	0.103	2.08	0.043	BB	3	141.6	1.15	0.81	Bi-Zygomaxillary	MV	47	94.4	4.18	4.42	1.21	0.636	3.70	0.001	BB	5	101.8	4.60	4.52	Nasion-Nasospinale	MV	47	49.9	2.66	5.33	2.24	0.057	0.24*	0.761	BB	12	50.2	3.98	7.92	Nasion-Prosthion	MV	47	70.5	3.91	5.54	2.45	0.029	3.54*	0.003	BB	13	64.2	6.12	9.54	Nasospinale-Prosthion	MV	47	20.7	2.85	13.77	1.36	0.447	4.76	0.000
Glabella-Opisthocranion	MV	47	189.1	5.75	3.04	1.35	0.573	1.97	0.054																																																																																																																																																																																																																																																																																								
	BB	14	192.5	4.95	2.57					Glabella-Lambda	MV	47	184.2	5.75	3.12	1.04	0.992	1.59	0.117	BB	14	187.0	5.63	3.01	Basion-Bregma	MV	45	133.4	4.04	3.03	1.81	0.144	3.77	0.000	BB	14	138.5	5.44	3.93	Basion-Nasion	MV	45	102.4	3.28	3.21	1.02	1.000	2.06	0.044	BB	13	104.6	3.25	3.16	Basion-Nasospinale	MV	45	99.0	3.88	3.92	1.38	0.609	1.43	0.159	BB	11	97.1	3.31	3.41	Basion-Prosthion	MV	45	106.5	4.37	4.11	1.52	0.326	1.82	0.074	BB	11	103.7	5.40	5.21	Bi-Sphenion	MV	45	103.6	3.77	3.64	1.50	0.568	0.03	0.974	BB	9	103.5	3.08	2.98	Glabella-Bregma	MV	47	109.9	4.38	3.99	1.65	0.202	2.82	0.007	BB	15	113.8	5.63	4.94	Nasion-Bregma	MV	47	113.4	4.28	3.77	1.40	0.373	3.10	0.003	BB	16	117.5	5.07	4.32	Metopion height	MV	47	25.6	2.20	8.61	1.83	0.118	3.34	0.001	BB	16	28.0	2.98	10.67	Nasion-Metopion	MV	47	51.0	3.34	6.56	1.00	1.000	1.70	0.095	BB	16	52.6	3.34	6.34	Max. Supraorbital breadth	MV	47	108.5	3.48	3.20	1.49	0.351	3.92	0.000	BB	11	113.2	4.24	3.74	Max. Posterior Frontal br.	MV	16	110.7	3.13	2.83	3.36	0.347	4.26	0.000	BB	4	117.7	1.70	1.45	Min. Postorbital breadth	MV	47	95.4	4.60	4.82	1.45	0.344	3.31	0.002	BB	14	100.3	5.55	5.53	Bi-Zygion	MV	44	135.5	5.50	3.69	18.82	0.103	2.08	0.043	BB	3	141.6	1.15	0.81	Bi-Zygomaxillary	MV	47	94.4	4.18	4.42	1.21	0.636	3.70	0.001	BB	5	101.8	4.60	4.52	Nasion-Nasospinale	MV	47	49.9	2.66	5.33	2.24	0.057	0.24*	0.761	BB	12	50.2	3.98	7.92	Nasion-Prosthion	MV	47	70.5	3.91	5.54	2.45	0.029	3.54*	0.003	BB	13	64.2	6.12	9.54	Nasospinale-Prosthion	MV	47	20.7	2.85	13.77	1.36	0.447	4.76	0.000	BB	12	16.1	3.32	20.57										
Glabella-Lambda	MV	47	184.2	5.75	3.12	1.04	0.992	1.59	0.117																																																																																																																																																																																																																																																																																								
	BB	14	187.0	5.63	3.01					Basion-Bregma	MV	45	133.4	4.04	3.03	1.81	0.144	3.77	0.000	BB	14	138.5	5.44	3.93	Basion-Nasion	MV	45	102.4	3.28	3.21	1.02	1.000	2.06	0.044	BB	13	104.6	3.25	3.16	Basion-Nasospinale	MV	45	99.0	3.88	3.92	1.38	0.609	1.43	0.159	BB	11	97.1	3.31	3.41	Basion-Prosthion	MV	45	106.5	4.37	4.11	1.52	0.326	1.82	0.074	BB	11	103.7	5.40	5.21	Bi-Sphenion	MV	45	103.6	3.77	3.64	1.50	0.568	0.03	0.974	BB	9	103.5	3.08	2.98	Glabella-Bregma	MV	47	109.9	4.38	3.99	1.65	0.202	2.82	0.007	BB	15	113.8	5.63	4.94	Nasion-Bregma	MV	47	113.4	4.28	3.77	1.40	0.373	3.10	0.003	BB	16	117.5	5.07	4.32	Metopion height	MV	47	25.6	2.20	8.61	1.83	0.118	3.34	0.001	BB	16	28.0	2.98	10.67	Nasion-Metopion	MV	47	51.0	3.34	6.56	1.00	1.000	1.70	0.095	BB	16	52.6	3.34	6.34	Max. Supraorbital breadth	MV	47	108.5	3.48	3.20	1.49	0.351	3.92	0.000	BB	11	113.2	4.24	3.74	Max. Posterior Frontal br.	MV	16	110.7	3.13	2.83	3.36	0.347	4.26	0.000	BB	4	117.7	1.70	1.45	Min. Postorbital breadth	MV	47	95.4	4.60	4.82	1.45	0.344	3.31	0.002	BB	14	100.3	5.55	5.53	Bi-Zygion	MV	44	135.5	5.50	3.69	18.82	0.103	2.08	0.043	BB	3	141.6	1.15	0.81	Bi-Zygomaxillary	MV	47	94.4	4.18	4.42	1.21	0.636	3.70	0.001	BB	5	101.8	4.60	4.52	Nasion-Nasospinale	MV	47	49.9	2.66	5.33	2.24	0.057	0.24*	0.761	BB	12	50.2	3.98	7.92	Nasion-Prosthion	MV	47	70.5	3.91	5.54	2.45	0.029	3.54*	0.003	BB	13	64.2	6.12	9.54	Nasospinale-Prosthion	MV	47	20.7	2.85	13.77	1.36	0.447	4.76	0.000	BB	12	16.1	3.32	20.57																									
Basion-Bregma	MV	45	133.4	4.04	3.03	1.81	0.144	3.77	0.000																																																																																																																																																																																																																																																																																								
	BB	14	138.5	5.44	3.93					Basion-Nasion	MV	45	102.4	3.28	3.21	1.02	1.000	2.06	0.044	BB	13	104.6	3.25	3.16	Basion-Nasospinale	MV	45	99.0	3.88	3.92	1.38	0.609	1.43	0.159	BB	11	97.1	3.31	3.41	Basion-Prosthion	MV	45	106.5	4.37	4.11	1.52	0.326	1.82	0.074	BB	11	103.7	5.40	5.21	Bi-Sphenion	MV	45	103.6	3.77	3.64	1.50	0.568	0.03	0.974	BB	9	103.5	3.08	2.98	Glabella-Bregma	MV	47	109.9	4.38	3.99	1.65	0.202	2.82	0.007	BB	15	113.8	5.63	4.94	Nasion-Bregma	MV	47	113.4	4.28	3.77	1.40	0.373	3.10	0.003	BB	16	117.5	5.07	4.32	Metopion height	MV	47	25.6	2.20	8.61	1.83	0.118	3.34	0.001	BB	16	28.0	2.98	10.67	Nasion-Metopion	MV	47	51.0	3.34	6.56	1.00	1.000	1.70	0.095	BB	16	52.6	3.34	6.34	Max. Supraorbital breadth	MV	47	108.5	3.48	3.20	1.49	0.351	3.92	0.000	BB	11	113.2	4.24	3.74	Max. Posterior Frontal br.	MV	16	110.7	3.13	2.83	3.36	0.347	4.26	0.000	BB	4	117.7	1.70	1.45	Min. Postorbital breadth	MV	47	95.4	4.60	4.82	1.45	0.344	3.31	0.002	BB	14	100.3	5.55	5.53	Bi-Zygion	MV	44	135.5	5.50	3.69	18.82	0.103	2.08	0.043	BB	3	141.6	1.15	0.81	Bi-Zygomaxillary	MV	47	94.4	4.18	4.42	1.21	0.636	3.70	0.001	BB	5	101.8	4.60	4.52	Nasion-Nasospinale	MV	47	49.9	2.66	5.33	2.24	0.057	0.24*	0.761	BB	12	50.2	3.98	7.92	Nasion-Prosthion	MV	47	70.5	3.91	5.54	2.45	0.029	3.54*	0.003	BB	13	64.2	6.12	9.54	Nasospinale-Prosthion	MV	47	20.7	2.85	13.77	1.36	0.447	4.76	0.000	BB	12	16.1	3.32	20.57																																								
Basion-Nasion	MV	45	102.4	3.28	3.21	1.02	1.000	2.06	0.044																																																																																																																																																																																																																																																																																								
	BB	13	104.6	3.25	3.16					Basion-Nasospinale	MV	45	99.0	3.88	3.92	1.38	0.609	1.43	0.159	BB	11	97.1	3.31	3.41	Basion-Prosthion	MV	45	106.5	4.37	4.11	1.52	0.326	1.82	0.074	BB	11	103.7	5.40	5.21	Bi-Sphenion	MV	45	103.6	3.77	3.64	1.50	0.568	0.03	0.974	BB	9	103.5	3.08	2.98	Glabella-Bregma	MV	47	109.9	4.38	3.99	1.65	0.202	2.82	0.007	BB	15	113.8	5.63	4.94	Nasion-Bregma	MV	47	113.4	4.28	3.77	1.40	0.373	3.10	0.003	BB	16	117.5	5.07	4.32	Metopion height	MV	47	25.6	2.20	8.61	1.83	0.118	3.34	0.001	BB	16	28.0	2.98	10.67	Nasion-Metopion	MV	47	51.0	3.34	6.56	1.00	1.000	1.70	0.095	BB	16	52.6	3.34	6.34	Max. Supraorbital breadth	MV	47	108.5	3.48	3.20	1.49	0.351	3.92	0.000	BB	11	113.2	4.24	3.74	Max. Posterior Frontal br.	MV	16	110.7	3.13	2.83	3.36	0.347	4.26	0.000	BB	4	117.7	1.70	1.45	Min. Postorbital breadth	MV	47	95.4	4.60	4.82	1.45	0.344	3.31	0.002	BB	14	100.3	5.55	5.53	Bi-Zygion	MV	44	135.5	5.50	3.69	18.82	0.103	2.08	0.043	BB	3	141.6	1.15	0.81	Bi-Zygomaxillary	MV	47	94.4	4.18	4.42	1.21	0.636	3.70	0.001	BB	5	101.8	4.60	4.52	Nasion-Nasospinale	MV	47	49.9	2.66	5.33	2.24	0.057	0.24*	0.761	BB	12	50.2	3.98	7.92	Nasion-Prosthion	MV	47	70.5	3.91	5.54	2.45	0.029	3.54*	0.003	BB	13	64.2	6.12	9.54	Nasospinale-Prosthion	MV	47	20.7	2.85	13.77	1.36	0.447	4.76	0.000	BB	12	16.1	3.32	20.57																																																							
Basion-Nasospinale	MV	45	99.0	3.88	3.92	1.38	0.609	1.43	0.159																																																																																																																																																																																																																																																																																								
	BB	11	97.1	3.31	3.41					Basion-Prosthion	MV	45	106.5	4.37	4.11	1.52	0.326	1.82	0.074	BB	11	103.7	5.40	5.21	Bi-Sphenion	MV	45	103.6	3.77	3.64	1.50	0.568	0.03	0.974	BB	9	103.5	3.08	2.98	Glabella-Bregma	MV	47	109.9	4.38	3.99	1.65	0.202	2.82	0.007	BB	15	113.8	5.63	4.94	Nasion-Bregma	MV	47	113.4	4.28	3.77	1.40	0.373	3.10	0.003	BB	16	117.5	5.07	4.32	Metopion height	MV	47	25.6	2.20	8.61	1.83	0.118	3.34	0.001	BB	16	28.0	2.98	10.67	Nasion-Metopion	MV	47	51.0	3.34	6.56	1.00	1.000	1.70	0.095	BB	16	52.6	3.34	6.34	Max. Supraorbital breadth	MV	47	108.5	3.48	3.20	1.49	0.351	3.92	0.000	BB	11	113.2	4.24	3.74	Max. Posterior Frontal br.	MV	16	110.7	3.13	2.83	3.36	0.347	4.26	0.000	BB	4	117.7	1.70	1.45	Min. Postorbital breadth	MV	47	95.4	4.60	4.82	1.45	0.344	3.31	0.002	BB	14	100.3	5.55	5.53	Bi-Zygion	MV	44	135.5	5.50	3.69	18.82	0.103	2.08	0.043	BB	3	141.6	1.15	0.81	Bi-Zygomaxillary	MV	47	94.4	4.18	4.42	1.21	0.636	3.70	0.001	BB	5	101.8	4.60	4.52	Nasion-Nasospinale	MV	47	49.9	2.66	5.33	2.24	0.057	0.24*	0.761	BB	12	50.2	3.98	7.92	Nasion-Prosthion	MV	47	70.5	3.91	5.54	2.45	0.029	3.54*	0.003	BB	13	64.2	6.12	9.54	Nasospinale-Prosthion	MV	47	20.7	2.85	13.77	1.36	0.447	4.76	0.000	BB	12	16.1	3.32	20.57																																																																						
Basion-Prosthion	MV	45	106.5	4.37	4.11	1.52	0.326	1.82	0.074																																																																																																																																																																																																																																																																																								
	BB	11	103.7	5.40	5.21					Bi-Sphenion	MV	45	103.6	3.77	3.64	1.50	0.568	0.03	0.974	BB	9	103.5	3.08	2.98	Glabella-Bregma	MV	47	109.9	4.38	3.99	1.65	0.202	2.82	0.007	BB	15	113.8	5.63	4.94	Nasion-Bregma	MV	47	113.4	4.28	3.77	1.40	0.373	3.10	0.003	BB	16	117.5	5.07	4.32	Metopion height	MV	47	25.6	2.20	8.61	1.83	0.118	3.34	0.001	BB	16	28.0	2.98	10.67	Nasion-Metopion	MV	47	51.0	3.34	6.56	1.00	1.000	1.70	0.095	BB	16	52.6	3.34	6.34	Max. Supraorbital breadth	MV	47	108.5	3.48	3.20	1.49	0.351	3.92	0.000	BB	11	113.2	4.24	3.74	Max. Posterior Frontal br.	MV	16	110.7	3.13	2.83	3.36	0.347	4.26	0.000	BB	4	117.7	1.70	1.45	Min. Postorbital breadth	MV	47	95.4	4.60	4.82	1.45	0.344	3.31	0.002	BB	14	100.3	5.55	5.53	Bi-Zygion	MV	44	135.5	5.50	3.69	18.82	0.103	2.08	0.043	BB	3	141.6	1.15	0.81	Bi-Zygomaxillary	MV	47	94.4	4.18	4.42	1.21	0.636	3.70	0.001	BB	5	101.8	4.60	4.52	Nasion-Nasospinale	MV	47	49.9	2.66	5.33	2.24	0.057	0.24*	0.761	BB	12	50.2	3.98	7.92	Nasion-Prosthion	MV	47	70.5	3.91	5.54	2.45	0.029	3.54*	0.003	BB	13	64.2	6.12	9.54	Nasospinale-Prosthion	MV	47	20.7	2.85	13.77	1.36	0.447	4.76	0.000	BB	12	16.1	3.32	20.57																																																																																					
Bi-Sphenion	MV	45	103.6	3.77	3.64	1.50	0.568	0.03	0.974																																																																																																																																																																																																																																																																																								
	BB	9	103.5	3.08	2.98					Glabella-Bregma	MV	47	109.9	4.38	3.99	1.65	0.202	2.82	0.007	BB	15	113.8	5.63	4.94	Nasion-Bregma	MV	47	113.4	4.28	3.77	1.40	0.373	3.10	0.003	BB	16	117.5	5.07	4.32	Metopion height	MV	47	25.6	2.20	8.61	1.83	0.118	3.34	0.001	BB	16	28.0	2.98	10.67	Nasion-Metopion	MV	47	51.0	3.34	6.56	1.00	1.000	1.70	0.095	BB	16	52.6	3.34	6.34	Max. Supraorbital breadth	MV	47	108.5	3.48	3.20	1.49	0.351	3.92	0.000	BB	11	113.2	4.24	3.74	Max. Posterior Frontal br.	MV	16	110.7	3.13	2.83	3.36	0.347	4.26	0.000	BB	4	117.7	1.70	1.45	Min. Postorbital breadth	MV	47	95.4	4.60	4.82	1.45	0.344	3.31	0.002	BB	14	100.3	5.55	5.53	Bi-Zygion	MV	44	135.5	5.50	3.69	18.82	0.103	2.08	0.043	BB	3	141.6	1.15	0.81	Bi-Zygomaxillary	MV	47	94.4	4.18	4.42	1.21	0.636	3.70	0.001	BB	5	101.8	4.60	4.52	Nasion-Nasospinale	MV	47	49.9	2.66	5.33	2.24	0.057	0.24*	0.761	BB	12	50.2	3.98	7.92	Nasion-Prosthion	MV	47	70.5	3.91	5.54	2.45	0.029	3.54*	0.003	BB	13	64.2	6.12	9.54	Nasospinale-Prosthion	MV	47	20.7	2.85	13.77	1.36	0.447	4.76	0.000	BB	12	16.1	3.32	20.57																																																																																																				
Glabella-Bregma	MV	47	109.9	4.38	3.99	1.65	0.202	2.82	0.007																																																																																																																																																																																																																																																																																								
	BB	15	113.8	5.63	4.94					Nasion-Bregma	MV	47	113.4	4.28	3.77	1.40	0.373	3.10	0.003	BB	16	117.5	5.07	4.32	Metopion height	MV	47	25.6	2.20	8.61	1.83	0.118	3.34	0.001	BB	16	28.0	2.98	10.67	Nasion-Metopion	MV	47	51.0	3.34	6.56	1.00	1.000	1.70	0.095	BB	16	52.6	3.34	6.34	Max. Supraorbital breadth	MV	47	108.5	3.48	3.20	1.49	0.351	3.92	0.000	BB	11	113.2	4.24	3.74	Max. Posterior Frontal br.	MV	16	110.7	3.13	2.83	3.36	0.347	4.26	0.000	BB	4	117.7	1.70	1.45	Min. Postorbital breadth	MV	47	95.4	4.60	4.82	1.45	0.344	3.31	0.002	BB	14	100.3	5.55	5.53	Bi-Zygion	MV	44	135.5	5.50	3.69	18.82	0.103	2.08	0.043	BB	3	141.6	1.15	0.81	Bi-Zygomaxillary	MV	47	94.4	4.18	4.42	1.21	0.636	3.70	0.001	BB	5	101.8	4.60	4.52	Nasion-Nasospinale	MV	47	49.9	2.66	5.33	2.24	0.057	0.24*	0.761	BB	12	50.2	3.98	7.92	Nasion-Prosthion	MV	47	70.5	3.91	5.54	2.45	0.029	3.54*	0.003	BB	13	64.2	6.12	9.54	Nasospinale-Prosthion	MV	47	20.7	2.85	13.77	1.36	0.447	4.76	0.000	BB	12	16.1	3.32	20.57																																																																																																																			
Nasion-Bregma	MV	47	113.4	4.28	3.77	1.40	0.373	3.10	0.003																																																																																																																																																																																																																																																																																								
	BB	16	117.5	5.07	4.32					Metopion height	MV	47	25.6	2.20	8.61	1.83	0.118	3.34	0.001	BB	16	28.0	2.98	10.67	Nasion-Metopion	MV	47	51.0	3.34	6.56	1.00	1.000	1.70	0.095	BB	16	52.6	3.34	6.34	Max. Supraorbital breadth	MV	47	108.5	3.48	3.20	1.49	0.351	3.92	0.000	BB	11	113.2	4.24	3.74	Max. Posterior Frontal br.	MV	16	110.7	3.13	2.83	3.36	0.347	4.26	0.000	BB	4	117.7	1.70	1.45	Min. Postorbital breadth	MV	47	95.4	4.60	4.82	1.45	0.344	3.31	0.002	BB	14	100.3	5.55	5.53	Bi-Zygion	MV	44	135.5	5.50	3.69	18.82	0.103	2.08	0.043	BB	3	141.6	1.15	0.81	Bi-Zygomaxillary	MV	47	94.4	4.18	4.42	1.21	0.636	3.70	0.001	BB	5	101.8	4.60	4.52	Nasion-Nasospinale	MV	47	49.9	2.66	5.33	2.24	0.057	0.24*	0.761	BB	12	50.2	3.98	7.92	Nasion-Prosthion	MV	47	70.5	3.91	5.54	2.45	0.029	3.54*	0.003	BB	13	64.2	6.12	9.54	Nasospinale-Prosthion	MV	47	20.7	2.85	13.77	1.36	0.447	4.76	0.000	BB	12	16.1	3.32	20.57																																																																																																																																		
Metopion height	MV	47	25.6	2.20	8.61	1.83	0.118	3.34	0.001																																																																																																																																																																																																																																																																																								
	BB	16	28.0	2.98	10.67					Nasion-Metopion	MV	47	51.0	3.34	6.56	1.00	1.000	1.70	0.095	BB	16	52.6	3.34	6.34	Max. Supraorbital breadth	MV	47	108.5	3.48	3.20	1.49	0.351	3.92	0.000	BB	11	113.2	4.24	3.74	Max. Posterior Frontal br.	MV	16	110.7	3.13	2.83	3.36	0.347	4.26	0.000	BB	4	117.7	1.70	1.45	Min. Postorbital breadth	MV	47	95.4	4.60	4.82	1.45	0.344	3.31	0.002	BB	14	100.3	5.55	5.53	Bi-Zygion	MV	44	135.5	5.50	3.69	18.82	0.103	2.08	0.043	BB	3	141.6	1.15	0.81	Bi-Zygomaxillary	MV	47	94.4	4.18	4.42	1.21	0.636	3.70	0.001	BB	5	101.8	4.60	4.52	Nasion-Nasospinale	MV	47	49.9	2.66	5.33	2.24	0.057	0.24*	0.761	BB	12	50.2	3.98	7.92	Nasion-Prosthion	MV	47	70.5	3.91	5.54	2.45	0.029	3.54*	0.003	BB	13	64.2	6.12	9.54	Nasospinale-Prosthion	MV	47	20.7	2.85	13.77	1.36	0.447	4.76	0.000	BB	12	16.1	3.32	20.57																																																																																																																																																	
Nasion-Metopion	MV	47	51.0	3.34	6.56	1.00	1.000	1.70	0.095																																																																																																																																																																																																																																																																																								
	BB	16	52.6	3.34	6.34					Max. Supraorbital breadth	MV	47	108.5	3.48	3.20	1.49	0.351	3.92	0.000	BB	11	113.2	4.24	3.74	Max. Posterior Frontal br.	MV	16	110.7	3.13	2.83	3.36	0.347	4.26	0.000	BB	4	117.7	1.70	1.45	Min. Postorbital breadth	MV	47	95.4	4.60	4.82	1.45	0.344	3.31	0.002	BB	14	100.3	5.55	5.53	Bi-Zygion	MV	44	135.5	5.50	3.69	18.82	0.103	2.08	0.043	BB	3	141.6	1.15	0.81	Bi-Zygomaxillary	MV	47	94.4	4.18	4.42	1.21	0.636	3.70	0.001	BB	5	101.8	4.60	4.52	Nasion-Nasospinale	MV	47	49.9	2.66	5.33	2.24	0.057	0.24*	0.761	BB	12	50.2	3.98	7.92	Nasion-Prosthion	MV	47	70.5	3.91	5.54	2.45	0.029	3.54*	0.003	BB	13	64.2	6.12	9.54	Nasospinale-Prosthion	MV	47	20.7	2.85	13.77	1.36	0.447	4.76	0.000	BB	12	16.1	3.32	20.57																																																																																																																																																																
Max. Supraorbital breadth	MV	47	108.5	3.48	3.20	1.49	0.351	3.92	0.000																																																																																																																																																																																																																																																																																								
	BB	11	113.2	4.24	3.74					Max. Posterior Frontal br.	MV	16	110.7	3.13	2.83	3.36	0.347	4.26	0.000	BB	4	117.7	1.70	1.45	Min. Postorbital breadth	MV	47	95.4	4.60	4.82	1.45	0.344	3.31	0.002	BB	14	100.3	5.55	5.53	Bi-Zygion	MV	44	135.5	5.50	3.69	18.82	0.103	2.08	0.043	BB	3	141.6	1.15	0.81	Bi-Zygomaxillary	MV	47	94.4	4.18	4.42	1.21	0.636	3.70	0.001	BB	5	101.8	4.60	4.52	Nasion-Nasospinale	MV	47	49.9	2.66	5.33	2.24	0.057	0.24*	0.761	BB	12	50.2	3.98	7.92	Nasion-Prosthion	MV	47	70.5	3.91	5.54	2.45	0.029	3.54*	0.003	BB	13	64.2	6.12	9.54	Nasospinale-Prosthion	MV	47	20.7	2.85	13.77	1.36	0.447	4.76	0.000	BB	12	16.1	3.32	20.57																																																																																																																																																																															
Max. Posterior Frontal br.	MV	16	110.7	3.13	2.83	3.36	0.347	4.26	0.000																																																																																																																																																																																																																																																																																								
	BB	4	117.7	1.70	1.45					Min. Postorbital breadth	MV	47	95.4	4.60	4.82	1.45	0.344	3.31	0.002	BB	14	100.3	5.55	5.53	Bi-Zygion	MV	44	135.5	5.50	3.69	18.82	0.103	2.08	0.043	BB	3	141.6	1.15	0.81	Bi-Zygomaxillary	MV	47	94.4	4.18	4.42	1.21	0.636	3.70	0.001	BB	5	101.8	4.60	4.52	Nasion-Nasospinale	MV	47	49.9	2.66	5.33	2.24	0.057	0.24*	0.761	BB	12	50.2	3.98	7.92	Nasion-Prosthion	MV	47	70.5	3.91	5.54	2.45	0.029	3.54*	0.003	BB	13	64.2	6.12	9.54	Nasospinale-Prosthion	MV	47	20.7	2.85	13.77	1.36	0.447	4.76	0.000	BB	12	16.1	3.32	20.57																																																																																																																																																																																														
Min. Postorbital breadth	MV	47	95.4	4.60	4.82	1.45	0.344	3.31	0.002																																																																																																																																																																																																																																																																																								
	BB	14	100.3	5.55	5.53					Bi-Zygion	MV	44	135.5	5.50	3.69	18.82	0.103	2.08	0.043	BB	3	141.6	1.15	0.81	Bi-Zygomaxillary	MV	47	94.4	4.18	4.42	1.21	0.636	3.70	0.001	BB	5	101.8	4.60	4.52	Nasion-Nasospinale	MV	47	49.9	2.66	5.33	2.24	0.057	0.24*	0.761	BB	12	50.2	3.98	7.92	Nasion-Prosthion	MV	47	70.5	3.91	5.54	2.45	0.029	3.54*	0.003	BB	13	64.2	6.12	9.54	Nasospinale-Prosthion	MV	47	20.7	2.85	13.77	1.36	0.447	4.76	0.000	BB	12	16.1	3.32	20.57																																																																																																																																																																																																													
Bi-Zygion	MV	44	135.5	5.50	3.69	18.82	0.103	2.08	0.043																																																																																																																																																																																																																																																																																								
	BB	3	141.6	1.15	0.81					Bi-Zygomaxillary	MV	47	94.4	4.18	4.42	1.21	0.636	3.70	0.001	BB	5	101.8	4.60	4.52	Nasion-Nasospinale	MV	47	49.9	2.66	5.33	2.24	0.057	0.24*	0.761	BB	12	50.2	3.98	7.92	Nasion-Prosthion	MV	47	70.5	3.91	5.54	2.45	0.029	3.54*	0.003	BB	13	64.2	6.12	9.54	Nasospinale-Prosthion	MV	47	20.7	2.85	13.77	1.36	0.447	4.76	0.000	BB	12	16.1	3.32	20.57																																																																																																																																																																																																																												
Bi-Zygomaxillary	MV	47	94.4	4.18	4.42	1.21	0.636	3.70	0.001																																																																																																																																																																																																																																																																																								
	BB	5	101.8	4.60	4.52					Nasion-Nasospinale	MV	47	49.9	2.66	5.33	2.24	0.057	0.24*	0.761	BB	12	50.2	3.98	7.92	Nasion-Prosthion	MV	47	70.5	3.91	5.54	2.45	0.029	3.54*	0.003	BB	13	64.2	6.12	9.54	Nasospinale-Prosthion	MV	47	20.7	2.85	13.77	1.36	0.447	4.76	0.000	BB	12	16.1	3.32	20.57																																																																																																																																																																																																																																											
Nasion-Nasospinale	MV	47	49.9	2.66	5.33	2.24	0.057	0.24*	0.761																																																																																																																																																																																																																																																																																								
	BB	12	50.2	3.98	7.92					Nasion-Prosthion	MV	47	70.5	3.91	5.54	2.45	0.029	3.54*	0.003	BB	13	64.2	6.12	9.54	Nasospinale-Prosthion	MV	47	20.7	2.85	13.77	1.36	0.447	4.76	0.000	BB	12	16.1	3.32	20.57																																																																																																																																																																																																																																																										
Nasion-Prosthion	MV	47	70.5	3.91	5.54	2.45	0.029	3.54*	0.003																																																																																																																																																																																																																																																																																								
	BB	13	64.2	6.12	9.54					Nasospinale-Prosthion	MV	47	20.7	2.85	13.77	1.36	0.447	4.76	0.000	BB	12	16.1	3.32	20.57																																																																																																																																																																																																																																																																									
Nasospinale-Prosthion	MV	47	20.7	2.85	13.77	1.36	0.447	4.76	0.000																																																																																																																																																																																																																																																																																								
	BB	12	16.1	3.32	20.57																																																																																																																																																																																																																																																																																												

*T calculated using separate variance estimate

		n	\bar{X}	s	CV	F	P	T	P																																																							
Orbital height	MV	47	32.9	2.50	7.61	1.93	0.326	2.35	0.023																																																							
	BB	9	35.0	1.80	5.15					Bi-Ectoconchion	MV	46	104.3	3.48	3.35	1.09	0.743	2.48	0.016	BB	5	108.4	3.64	3.36	Alveolar length	MV	47	64.1	3.98	6.20	1.57	0.363	2.71	0.009	BB	15	61.1	3.18	5.21	Alveolar breadth	MV	47	69.3	3.55	5.12	1.16	0.670	1.46	0.150	BB	14	67.7	3.83	5.66	Mastoid depth	MV	47	31.2	2.35	7.55	1.06	0.967	1.40	0.167
Bi-Ectoconchion	MV	46	104.3	3.48	3.35	1.09	0.743	2.48	0.016																																																							
	BB	5	108.4	3.64	3.36					Alveolar length	MV	47	64.1	3.98	6.20	1.57	0.363	2.71	0.009	BB	15	61.1	3.18	5.21	Alveolar breadth	MV	47	69.3	3.55	5.12	1.16	0.670	1.46	0.150	BB	14	67.7	3.83	5.66	Mastoid depth	MV	47	31.2	2.35	7.55	1.06	0.967	1.40	0.167	BB	14	30.2	2.29	7.59										
Alveolar length	MV	47	64.1	3.98	6.20	1.57	0.363	2.71	0.009																																																							
	BB	15	61.1	3.18	5.21					Alveolar breadth	MV	47	69.3	3.55	5.12	1.16	0.670	1.46	0.150	BB	14	67.7	3.83	5.66	Mastoid depth	MV	47	31.2	2.35	7.55	1.06	0.967	1.40	0.167	BB	14	30.2	2.29	7.59																									
Alveolar breadth	MV	47	69.3	3.55	5.12	1.16	0.670	1.46	0.150																																																							
	BB	14	67.7	3.83	5.66					Mastoid depth	MV	47	31.2	2.35	7.55	1.06	0.967	1.40	0.167	BB	14	30.2	2.29	7.59																																								
Mastoid depth	MV	47	31.2	2.35	7.55	1.06	0.967	1.40	0.167																																																							
	BB	14	30.2	2.29	7.59																																																											

Table 55

Comparative statistics for the Swanport (SW) and Broadbeach (BB) male crania (mm.)

		n	\bar{X}	s	CV	F	P	T	P																																																																																																																																																																																																																																																																																								
Max. Bi-Parietal breadth	SW	23	129.9	2.93	2.26	2.37	0.069	1.34	0.188																																																																																																																																																																																																																																																																																								
	BB	15	131.5	4.51	3.43					Glabella-Opisthocranion	SW	23	189.1	5.33	2.82	1.16	0.807	1.89	0.067	BB	14	192.5	4.95	2.57	Glabella-Lambda	SW	23	182.1	5.28	2.90	1.14	0.761	2.67	0.011	BB	14	187.0	5.63	3.01	Basion-Bregma	SW	22	128.9	4.82	3.74	1.27	0.603	5.55	0.000	BB	14	138.5	5.44	3.93	Basion-Nasion	SW	22	101.4	3.51	3.46	1.17	0.805	2.68	0.011	BB	13	104.6	3.25	3.16	Basion-Nasospinale	SW	22	99.0	3.90	3.95	1.39	0.601	1.35	0.185	BB	11	97.1	3.31	3.41	Basion-Prosthion	SW	21	104.5	4.77	4.56	1.28	0.606	0.43	0.671	BB	11	103.7	5.40	5.21	Bi-Sphenion	SW	22	101.4	3.98	3.93	1.67	0.466	1.44	0.160	BB	9	103.5	3.08	2.98	Glabella-Bregma	SW	23	109.3	3.43	3.14	2.69	0.037	2.82*	0.010	BB	15	113.8	5.63	4.94	Nasion-Bregma	SW	23	112.3	3.14	2.79	2.61	0.040	3.64*	0.001	BB	16	117.5	5.07	4.32	Metopion height	SW	23	25.1	2.26	9.01	1.73	0.234	3.36	0.002	BB	16	28.0	2.98	10.67	Nasion-Metopion	SW	23	49.9	2.95	5.92	1.28	0.584	2.74	0.010	BB	16	52.6	3.34	6.34	Max. Supraorbital breadth	SW	23	109.7	3.76	3.43	1.27	0.611	2.46	0.020	BB	11	113.2	4.24	3.74	Max. Posterior Frontal br.	SW	7	111.1	4.88	4.39	8.16	0.113	2.57	0.030	BB	4	117.7	1.70	1.45	Min. Postorbital breadth	SW	23	95.5	4.09	5.29	1.84	0.202	3.01	0.005	BB	14	100.3	5.55	5.53	Bi-Zygion	SW	18	136.8	3.02	2.21	6.87	0.269	2.65	0.016	BB	3	141.6	1.15	0.81	Bi-Zygomaxillary	SW	23	96.8	4.02	4.15	1.31	0.596	2.43	0.023	BB	5	101.8	4.60	4.52	Nasion-Nasospinale	SW	23	51.4	2.25	4.38	3.12	0.022	0.99*	0.338	BB	12	50.2	3.98	7.92	Nasion-Prosthion	SW	22	67.6	2.88	4.26	4.50	0.003	2.24	0.032	BB	13	64.2	6.12	9.54	Nasospinale-Prosthion	SW	22	16.0	2.51	15.68	1.75	0.262	0.12	0.905
Glabella-Opisthocranion	SW	23	189.1	5.33	2.82	1.16	0.807	1.89	0.067																																																																																																																																																																																																																																																																																								
	BB	14	192.5	4.95	2.57					Glabella-Lambda	SW	23	182.1	5.28	2.90	1.14	0.761	2.67	0.011	BB	14	187.0	5.63	3.01	Basion-Bregma	SW	22	128.9	4.82	3.74	1.27	0.603	5.55	0.000	BB	14	138.5	5.44	3.93	Basion-Nasion	SW	22	101.4	3.51	3.46	1.17	0.805	2.68	0.011	BB	13	104.6	3.25	3.16	Basion-Nasospinale	SW	22	99.0	3.90	3.95	1.39	0.601	1.35	0.185	BB	11	97.1	3.31	3.41	Basion-Prosthion	SW	21	104.5	4.77	4.56	1.28	0.606	0.43	0.671	BB	11	103.7	5.40	5.21	Bi-Sphenion	SW	22	101.4	3.98	3.93	1.67	0.466	1.44	0.160	BB	9	103.5	3.08	2.98	Glabella-Bregma	SW	23	109.3	3.43	3.14	2.69	0.037	2.82*	0.010	BB	15	113.8	5.63	4.94	Nasion-Bregma	SW	23	112.3	3.14	2.79	2.61	0.040	3.64*	0.001	BB	16	117.5	5.07	4.32	Metopion height	SW	23	25.1	2.26	9.01	1.73	0.234	3.36	0.002	BB	16	28.0	2.98	10.67	Nasion-Metopion	SW	23	49.9	2.95	5.92	1.28	0.584	2.74	0.010	BB	16	52.6	3.34	6.34	Max. Supraorbital breadth	SW	23	109.7	3.76	3.43	1.27	0.611	2.46	0.020	BB	11	113.2	4.24	3.74	Max. Posterior Frontal br.	SW	7	111.1	4.88	4.39	8.16	0.113	2.57	0.030	BB	4	117.7	1.70	1.45	Min. Postorbital breadth	SW	23	95.5	4.09	5.29	1.84	0.202	3.01	0.005	BB	14	100.3	5.55	5.53	Bi-Zygion	SW	18	136.8	3.02	2.21	6.87	0.269	2.65	0.016	BB	3	141.6	1.15	0.81	Bi-Zygomaxillary	SW	23	96.8	4.02	4.15	1.31	0.596	2.43	0.023	BB	5	101.8	4.60	4.52	Nasion-Nasospinale	SW	23	51.4	2.25	4.38	3.12	0.022	0.99*	0.338	BB	12	50.2	3.98	7.92	Nasion-Prosthion	SW	22	67.6	2.88	4.26	4.50	0.003	2.24	0.032	BB	13	64.2	6.12	9.54	Nasospinale-Prosthion	SW	22	16.0	2.51	15.68	1.75	0.262	0.12	0.905	BB	12	16.1	3.32	20.57										
Glabella-Lambda	SW	23	182.1	5.28	2.90	1.14	0.761	2.67	0.011																																																																																																																																																																																																																																																																																								
	BB	14	187.0	5.63	3.01					Basion-Bregma	SW	22	128.9	4.82	3.74	1.27	0.603	5.55	0.000	BB	14	138.5	5.44	3.93	Basion-Nasion	SW	22	101.4	3.51	3.46	1.17	0.805	2.68	0.011	BB	13	104.6	3.25	3.16	Basion-Nasospinale	SW	22	99.0	3.90	3.95	1.39	0.601	1.35	0.185	BB	11	97.1	3.31	3.41	Basion-Prosthion	SW	21	104.5	4.77	4.56	1.28	0.606	0.43	0.671	BB	11	103.7	5.40	5.21	Bi-Sphenion	SW	22	101.4	3.98	3.93	1.67	0.466	1.44	0.160	BB	9	103.5	3.08	2.98	Glabella-Bregma	SW	23	109.3	3.43	3.14	2.69	0.037	2.82*	0.010	BB	15	113.8	5.63	4.94	Nasion-Bregma	SW	23	112.3	3.14	2.79	2.61	0.040	3.64*	0.001	BB	16	117.5	5.07	4.32	Metopion height	SW	23	25.1	2.26	9.01	1.73	0.234	3.36	0.002	BB	16	28.0	2.98	10.67	Nasion-Metopion	SW	23	49.9	2.95	5.92	1.28	0.584	2.74	0.010	BB	16	52.6	3.34	6.34	Max. Supraorbital breadth	SW	23	109.7	3.76	3.43	1.27	0.611	2.46	0.020	BB	11	113.2	4.24	3.74	Max. Posterior Frontal br.	SW	7	111.1	4.88	4.39	8.16	0.113	2.57	0.030	BB	4	117.7	1.70	1.45	Min. Postorbital breadth	SW	23	95.5	4.09	5.29	1.84	0.202	3.01	0.005	BB	14	100.3	5.55	5.53	Bi-Zygion	SW	18	136.8	3.02	2.21	6.87	0.269	2.65	0.016	BB	3	141.6	1.15	0.81	Bi-Zygomaxillary	SW	23	96.8	4.02	4.15	1.31	0.596	2.43	0.023	BB	5	101.8	4.60	4.52	Nasion-Nasospinale	SW	23	51.4	2.25	4.38	3.12	0.022	0.99*	0.338	BB	12	50.2	3.98	7.92	Nasion-Prosthion	SW	22	67.6	2.88	4.26	4.50	0.003	2.24	0.032	BB	13	64.2	6.12	9.54	Nasospinale-Prosthion	SW	22	16.0	2.51	15.68	1.75	0.262	0.12	0.905	BB	12	16.1	3.32	20.57																									
Basion-Bregma	SW	22	128.9	4.82	3.74	1.27	0.603	5.55	0.000																																																																																																																																																																																																																																																																																								
	BB	14	138.5	5.44	3.93					Basion-Nasion	SW	22	101.4	3.51	3.46	1.17	0.805	2.68	0.011	BB	13	104.6	3.25	3.16	Basion-Nasospinale	SW	22	99.0	3.90	3.95	1.39	0.601	1.35	0.185	BB	11	97.1	3.31	3.41	Basion-Prosthion	SW	21	104.5	4.77	4.56	1.28	0.606	0.43	0.671	BB	11	103.7	5.40	5.21	Bi-Sphenion	SW	22	101.4	3.98	3.93	1.67	0.466	1.44	0.160	BB	9	103.5	3.08	2.98	Glabella-Bregma	SW	23	109.3	3.43	3.14	2.69	0.037	2.82*	0.010	BB	15	113.8	5.63	4.94	Nasion-Bregma	SW	23	112.3	3.14	2.79	2.61	0.040	3.64*	0.001	BB	16	117.5	5.07	4.32	Metopion height	SW	23	25.1	2.26	9.01	1.73	0.234	3.36	0.002	BB	16	28.0	2.98	10.67	Nasion-Metopion	SW	23	49.9	2.95	5.92	1.28	0.584	2.74	0.010	BB	16	52.6	3.34	6.34	Max. Supraorbital breadth	SW	23	109.7	3.76	3.43	1.27	0.611	2.46	0.020	BB	11	113.2	4.24	3.74	Max. Posterior Frontal br.	SW	7	111.1	4.88	4.39	8.16	0.113	2.57	0.030	BB	4	117.7	1.70	1.45	Min. Postorbital breadth	SW	23	95.5	4.09	5.29	1.84	0.202	3.01	0.005	BB	14	100.3	5.55	5.53	Bi-Zygion	SW	18	136.8	3.02	2.21	6.87	0.269	2.65	0.016	BB	3	141.6	1.15	0.81	Bi-Zygomaxillary	SW	23	96.8	4.02	4.15	1.31	0.596	2.43	0.023	BB	5	101.8	4.60	4.52	Nasion-Nasospinale	SW	23	51.4	2.25	4.38	3.12	0.022	0.99*	0.338	BB	12	50.2	3.98	7.92	Nasion-Prosthion	SW	22	67.6	2.88	4.26	4.50	0.003	2.24	0.032	BB	13	64.2	6.12	9.54	Nasospinale-Prosthion	SW	22	16.0	2.51	15.68	1.75	0.262	0.12	0.905	BB	12	16.1	3.32	20.57																																								
Basion-Nasion	SW	22	101.4	3.51	3.46	1.17	0.805	2.68	0.011																																																																																																																																																																																																																																																																																								
	BB	13	104.6	3.25	3.16					Basion-Nasospinale	SW	22	99.0	3.90	3.95	1.39	0.601	1.35	0.185	BB	11	97.1	3.31	3.41	Basion-Prosthion	SW	21	104.5	4.77	4.56	1.28	0.606	0.43	0.671	BB	11	103.7	5.40	5.21	Bi-Sphenion	SW	22	101.4	3.98	3.93	1.67	0.466	1.44	0.160	BB	9	103.5	3.08	2.98	Glabella-Bregma	SW	23	109.3	3.43	3.14	2.69	0.037	2.82*	0.010	BB	15	113.8	5.63	4.94	Nasion-Bregma	SW	23	112.3	3.14	2.79	2.61	0.040	3.64*	0.001	BB	16	117.5	5.07	4.32	Metopion height	SW	23	25.1	2.26	9.01	1.73	0.234	3.36	0.002	BB	16	28.0	2.98	10.67	Nasion-Metopion	SW	23	49.9	2.95	5.92	1.28	0.584	2.74	0.010	BB	16	52.6	3.34	6.34	Max. Supraorbital breadth	SW	23	109.7	3.76	3.43	1.27	0.611	2.46	0.020	BB	11	113.2	4.24	3.74	Max. Posterior Frontal br.	SW	7	111.1	4.88	4.39	8.16	0.113	2.57	0.030	BB	4	117.7	1.70	1.45	Min. Postorbital breadth	SW	23	95.5	4.09	5.29	1.84	0.202	3.01	0.005	BB	14	100.3	5.55	5.53	Bi-Zygion	SW	18	136.8	3.02	2.21	6.87	0.269	2.65	0.016	BB	3	141.6	1.15	0.81	Bi-Zygomaxillary	SW	23	96.8	4.02	4.15	1.31	0.596	2.43	0.023	BB	5	101.8	4.60	4.52	Nasion-Nasospinale	SW	23	51.4	2.25	4.38	3.12	0.022	0.99*	0.338	BB	12	50.2	3.98	7.92	Nasion-Prosthion	SW	22	67.6	2.88	4.26	4.50	0.003	2.24	0.032	BB	13	64.2	6.12	9.54	Nasospinale-Prosthion	SW	22	16.0	2.51	15.68	1.75	0.262	0.12	0.905	BB	12	16.1	3.32	20.57																																																							
Basion-Nasospinale	SW	22	99.0	3.90	3.95	1.39	0.601	1.35	0.185																																																																																																																																																																																																																																																																																								
	BB	11	97.1	3.31	3.41					Basion-Prosthion	SW	21	104.5	4.77	4.56	1.28	0.606	0.43	0.671	BB	11	103.7	5.40	5.21	Bi-Sphenion	SW	22	101.4	3.98	3.93	1.67	0.466	1.44	0.160	BB	9	103.5	3.08	2.98	Glabella-Bregma	SW	23	109.3	3.43	3.14	2.69	0.037	2.82*	0.010	BB	15	113.8	5.63	4.94	Nasion-Bregma	SW	23	112.3	3.14	2.79	2.61	0.040	3.64*	0.001	BB	16	117.5	5.07	4.32	Metopion height	SW	23	25.1	2.26	9.01	1.73	0.234	3.36	0.002	BB	16	28.0	2.98	10.67	Nasion-Metopion	SW	23	49.9	2.95	5.92	1.28	0.584	2.74	0.010	BB	16	52.6	3.34	6.34	Max. Supraorbital breadth	SW	23	109.7	3.76	3.43	1.27	0.611	2.46	0.020	BB	11	113.2	4.24	3.74	Max. Posterior Frontal br.	SW	7	111.1	4.88	4.39	8.16	0.113	2.57	0.030	BB	4	117.7	1.70	1.45	Min. Postorbital breadth	SW	23	95.5	4.09	5.29	1.84	0.202	3.01	0.005	BB	14	100.3	5.55	5.53	Bi-Zygion	SW	18	136.8	3.02	2.21	6.87	0.269	2.65	0.016	BB	3	141.6	1.15	0.81	Bi-Zygomaxillary	SW	23	96.8	4.02	4.15	1.31	0.596	2.43	0.023	BB	5	101.8	4.60	4.52	Nasion-Nasospinale	SW	23	51.4	2.25	4.38	3.12	0.022	0.99*	0.338	BB	12	50.2	3.98	7.92	Nasion-Prosthion	SW	22	67.6	2.88	4.26	4.50	0.003	2.24	0.032	BB	13	64.2	6.12	9.54	Nasospinale-Prosthion	SW	22	16.0	2.51	15.68	1.75	0.262	0.12	0.905	BB	12	16.1	3.32	20.57																																																																						
Basion-Prosthion	SW	21	104.5	4.77	4.56	1.28	0.606	0.43	0.671																																																																																																																																																																																																																																																																																								
	BB	11	103.7	5.40	5.21					Bi-Sphenion	SW	22	101.4	3.98	3.93	1.67	0.466	1.44	0.160	BB	9	103.5	3.08	2.98	Glabella-Bregma	SW	23	109.3	3.43	3.14	2.69	0.037	2.82*	0.010	BB	15	113.8	5.63	4.94	Nasion-Bregma	SW	23	112.3	3.14	2.79	2.61	0.040	3.64*	0.001	BB	16	117.5	5.07	4.32	Metopion height	SW	23	25.1	2.26	9.01	1.73	0.234	3.36	0.002	BB	16	28.0	2.98	10.67	Nasion-Metopion	SW	23	49.9	2.95	5.92	1.28	0.584	2.74	0.010	BB	16	52.6	3.34	6.34	Max. Supraorbital breadth	SW	23	109.7	3.76	3.43	1.27	0.611	2.46	0.020	BB	11	113.2	4.24	3.74	Max. Posterior Frontal br.	SW	7	111.1	4.88	4.39	8.16	0.113	2.57	0.030	BB	4	117.7	1.70	1.45	Min. Postorbital breadth	SW	23	95.5	4.09	5.29	1.84	0.202	3.01	0.005	BB	14	100.3	5.55	5.53	Bi-Zygion	SW	18	136.8	3.02	2.21	6.87	0.269	2.65	0.016	BB	3	141.6	1.15	0.81	Bi-Zygomaxillary	SW	23	96.8	4.02	4.15	1.31	0.596	2.43	0.023	BB	5	101.8	4.60	4.52	Nasion-Nasospinale	SW	23	51.4	2.25	4.38	3.12	0.022	0.99*	0.338	BB	12	50.2	3.98	7.92	Nasion-Prosthion	SW	22	67.6	2.88	4.26	4.50	0.003	2.24	0.032	BB	13	64.2	6.12	9.54	Nasospinale-Prosthion	SW	22	16.0	2.51	15.68	1.75	0.262	0.12	0.905	BB	12	16.1	3.32	20.57																																																																																					
Bi-Sphenion	SW	22	101.4	3.98	3.93	1.67	0.466	1.44	0.160																																																																																																																																																																																																																																																																																								
	BB	9	103.5	3.08	2.98					Glabella-Bregma	SW	23	109.3	3.43	3.14	2.69	0.037	2.82*	0.010	BB	15	113.8	5.63	4.94	Nasion-Bregma	SW	23	112.3	3.14	2.79	2.61	0.040	3.64*	0.001	BB	16	117.5	5.07	4.32	Metopion height	SW	23	25.1	2.26	9.01	1.73	0.234	3.36	0.002	BB	16	28.0	2.98	10.67	Nasion-Metopion	SW	23	49.9	2.95	5.92	1.28	0.584	2.74	0.010	BB	16	52.6	3.34	6.34	Max. Supraorbital breadth	SW	23	109.7	3.76	3.43	1.27	0.611	2.46	0.020	BB	11	113.2	4.24	3.74	Max. Posterior Frontal br.	SW	7	111.1	4.88	4.39	8.16	0.113	2.57	0.030	BB	4	117.7	1.70	1.45	Min. Postorbital breadth	SW	23	95.5	4.09	5.29	1.84	0.202	3.01	0.005	BB	14	100.3	5.55	5.53	Bi-Zygion	SW	18	136.8	3.02	2.21	6.87	0.269	2.65	0.016	BB	3	141.6	1.15	0.81	Bi-Zygomaxillary	SW	23	96.8	4.02	4.15	1.31	0.596	2.43	0.023	BB	5	101.8	4.60	4.52	Nasion-Nasospinale	SW	23	51.4	2.25	4.38	3.12	0.022	0.99*	0.338	BB	12	50.2	3.98	7.92	Nasion-Prosthion	SW	22	67.6	2.88	4.26	4.50	0.003	2.24	0.032	BB	13	64.2	6.12	9.54	Nasospinale-Prosthion	SW	22	16.0	2.51	15.68	1.75	0.262	0.12	0.905	BB	12	16.1	3.32	20.57																																																																																																				
Glabella-Bregma	SW	23	109.3	3.43	3.14	2.69	0.037	2.82*	0.010																																																																																																																																																																																																																																																																																								
	BB	15	113.8	5.63	4.94					Nasion-Bregma	SW	23	112.3	3.14	2.79	2.61	0.040	3.64*	0.001	BB	16	117.5	5.07	4.32	Metopion height	SW	23	25.1	2.26	9.01	1.73	0.234	3.36	0.002	BB	16	28.0	2.98	10.67	Nasion-Metopion	SW	23	49.9	2.95	5.92	1.28	0.584	2.74	0.010	BB	16	52.6	3.34	6.34	Max. Supraorbital breadth	SW	23	109.7	3.76	3.43	1.27	0.611	2.46	0.020	BB	11	113.2	4.24	3.74	Max. Posterior Frontal br.	SW	7	111.1	4.88	4.39	8.16	0.113	2.57	0.030	BB	4	117.7	1.70	1.45	Min. Postorbital breadth	SW	23	95.5	4.09	5.29	1.84	0.202	3.01	0.005	BB	14	100.3	5.55	5.53	Bi-Zygion	SW	18	136.8	3.02	2.21	6.87	0.269	2.65	0.016	BB	3	141.6	1.15	0.81	Bi-Zygomaxillary	SW	23	96.8	4.02	4.15	1.31	0.596	2.43	0.023	BB	5	101.8	4.60	4.52	Nasion-Nasospinale	SW	23	51.4	2.25	4.38	3.12	0.022	0.99*	0.338	BB	12	50.2	3.98	7.92	Nasion-Prosthion	SW	22	67.6	2.88	4.26	4.50	0.003	2.24	0.032	BB	13	64.2	6.12	9.54	Nasospinale-Prosthion	SW	22	16.0	2.51	15.68	1.75	0.262	0.12	0.905	BB	12	16.1	3.32	20.57																																																																																																																			
Nasion-Bregma	SW	23	112.3	3.14	2.79	2.61	0.040	3.64*	0.001																																																																																																																																																																																																																																																																																								
	BB	16	117.5	5.07	4.32					Metopion height	SW	23	25.1	2.26	9.01	1.73	0.234	3.36	0.002	BB	16	28.0	2.98	10.67	Nasion-Metopion	SW	23	49.9	2.95	5.92	1.28	0.584	2.74	0.010	BB	16	52.6	3.34	6.34	Max. Supraorbital breadth	SW	23	109.7	3.76	3.43	1.27	0.611	2.46	0.020	BB	11	113.2	4.24	3.74	Max. Posterior Frontal br.	SW	7	111.1	4.88	4.39	8.16	0.113	2.57	0.030	BB	4	117.7	1.70	1.45	Min. Postorbital breadth	SW	23	95.5	4.09	5.29	1.84	0.202	3.01	0.005	BB	14	100.3	5.55	5.53	Bi-Zygion	SW	18	136.8	3.02	2.21	6.87	0.269	2.65	0.016	BB	3	141.6	1.15	0.81	Bi-Zygomaxillary	SW	23	96.8	4.02	4.15	1.31	0.596	2.43	0.023	BB	5	101.8	4.60	4.52	Nasion-Nasospinale	SW	23	51.4	2.25	4.38	3.12	0.022	0.99*	0.338	BB	12	50.2	3.98	7.92	Nasion-Prosthion	SW	22	67.6	2.88	4.26	4.50	0.003	2.24	0.032	BB	13	64.2	6.12	9.54	Nasospinale-Prosthion	SW	22	16.0	2.51	15.68	1.75	0.262	0.12	0.905	BB	12	16.1	3.32	20.57																																																																																																																																		
Metopion height	SW	23	25.1	2.26	9.01	1.73	0.234	3.36	0.002																																																																																																																																																																																																																																																																																								
	BB	16	28.0	2.98	10.67					Nasion-Metopion	SW	23	49.9	2.95	5.92	1.28	0.584	2.74	0.010	BB	16	52.6	3.34	6.34	Max. Supraorbital breadth	SW	23	109.7	3.76	3.43	1.27	0.611	2.46	0.020	BB	11	113.2	4.24	3.74	Max. Posterior Frontal br.	SW	7	111.1	4.88	4.39	8.16	0.113	2.57	0.030	BB	4	117.7	1.70	1.45	Min. Postorbital breadth	SW	23	95.5	4.09	5.29	1.84	0.202	3.01	0.005	BB	14	100.3	5.55	5.53	Bi-Zygion	SW	18	136.8	3.02	2.21	6.87	0.269	2.65	0.016	BB	3	141.6	1.15	0.81	Bi-Zygomaxillary	SW	23	96.8	4.02	4.15	1.31	0.596	2.43	0.023	BB	5	101.8	4.60	4.52	Nasion-Nasospinale	SW	23	51.4	2.25	4.38	3.12	0.022	0.99*	0.338	BB	12	50.2	3.98	7.92	Nasion-Prosthion	SW	22	67.6	2.88	4.26	4.50	0.003	2.24	0.032	BB	13	64.2	6.12	9.54	Nasospinale-Prosthion	SW	22	16.0	2.51	15.68	1.75	0.262	0.12	0.905	BB	12	16.1	3.32	20.57																																																																																																																																																	
Nasion-Metopion	SW	23	49.9	2.95	5.92	1.28	0.584	2.74	0.010																																																																																																																																																																																																																																																																																								
	BB	16	52.6	3.34	6.34					Max. Supraorbital breadth	SW	23	109.7	3.76	3.43	1.27	0.611	2.46	0.020	BB	11	113.2	4.24	3.74	Max. Posterior Frontal br.	SW	7	111.1	4.88	4.39	8.16	0.113	2.57	0.030	BB	4	117.7	1.70	1.45	Min. Postorbital breadth	SW	23	95.5	4.09	5.29	1.84	0.202	3.01	0.005	BB	14	100.3	5.55	5.53	Bi-Zygion	SW	18	136.8	3.02	2.21	6.87	0.269	2.65	0.016	BB	3	141.6	1.15	0.81	Bi-Zygomaxillary	SW	23	96.8	4.02	4.15	1.31	0.596	2.43	0.023	BB	5	101.8	4.60	4.52	Nasion-Nasospinale	SW	23	51.4	2.25	4.38	3.12	0.022	0.99*	0.338	BB	12	50.2	3.98	7.92	Nasion-Prosthion	SW	22	67.6	2.88	4.26	4.50	0.003	2.24	0.032	BB	13	64.2	6.12	9.54	Nasospinale-Prosthion	SW	22	16.0	2.51	15.68	1.75	0.262	0.12	0.905	BB	12	16.1	3.32	20.57																																																																																																																																																																
Max. Supraorbital breadth	SW	23	109.7	3.76	3.43	1.27	0.611	2.46	0.020																																																																																																																																																																																																																																																																																								
	BB	11	113.2	4.24	3.74					Max. Posterior Frontal br.	SW	7	111.1	4.88	4.39	8.16	0.113	2.57	0.030	BB	4	117.7	1.70	1.45	Min. Postorbital breadth	SW	23	95.5	4.09	5.29	1.84	0.202	3.01	0.005	BB	14	100.3	5.55	5.53	Bi-Zygion	SW	18	136.8	3.02	2.21	6.87	0.269	2.65	0.016	BB	3	141.6	1.15	0.81	Bi-Zygomaxillary	SW	23	96.8	4.02	4.15	1.31	0.596	2.43	0.023	BB	5	101.8	4.60	4.52	Nasion-Nasospinale	SW	23	51.4	2.25	4.38	3.12	0.022	0.99*	0.338	BB	12	50.2	3.98	7.92	Nasion-Prosthion	SW	22	67.6	2.88	4.26	4.50	0.003	2.24	0.032	BB	13	64.2	6.12	9.54	Nasospinale-Prosthion	SW	22	16.0	2.51	15.68	1.75	0.262	0.12	0.905	BB	12	16.1	3.32	20.57																																																																																																																																																																															
Max. Posterior Frontal br.	SW	7	111.1	4.88	4.39	8.16	0.113	2.57	0.030																																																																																																																																																																																																																																																																																								
	BB	4	117.7	1.70	1.45					Min. Postorbital breadth	SW	23	95.5	4.09	5.29	1.84	0.202	3.01	0.005	BB	14	100.3	5.55	5.53	Bi-Zygion	SW	18	136.8	3.02	2.21	6.87	0.269	2.65	0.016	BB	3	141.6	1.15	0.81	Bi-Zygomaxillary	SW	23	96.8	4.02	4.15	1.31	0.596	2.43	0.023	BB	5	101.8	4.60	4.52	Nasion-Nasospinale	SW	23	51.4	2.25	4.38	3.12	0.022	0.99*	0.338	BB	12	50.2	3.98	7.92	Nasion-Prosthion	SW	22	67.6	2.88	4.26	4.50	0.003	2.24	0.032	BB	13	64.2	6.12	9.54	Nasospinale-Prosthion	SW	22	16.0	2.51	15.68	1.75	0.262	0.12	0.905	BB	12	16.1	3.32	20.57																																																																																																																																																																																														
Min. Postorbital breadth	SW	23	95.5	4.09	5.29	1.84	0.202	3.01	0.005																																																																																																																																																																																																																																																																																								
	BB	14	100.3	5.55	5.53					Bi-Zygion	SW	18	136.8	3.02	2.21	6.87	0.269	2.65	0.016	BB	3	141.6	1.15	0.81	Bi-Zygomaxillary	SW	23	96.8	4.02	4.15	1.31	0.596	2.43	0.023	BB	5	101.8	4.60	4.52	Nasion-Nasospinale	SW	23	51.4	2.25	4.38	3.12	0.022	0.99*	0.338	BB	12	50.2	3.98	7.92	Nasion-Prosthion	SW	22	67.6	2.88	4.26	4.50	0.003	2.24	0.032	BB	13	64.2	6.12	9.54	Nasospinale-Prosthion	SW	22	16.0	2.51	15.68	1.75	0.262	0.12	0.905	BB	12	16.1	3.32	20.57																																																																																																																																																																																																													
Bi-Zygion	SW	18	136.8	3.02	2.21	6.87	0.269	2.65	0.016																																																																																																																																																																																																																																																																																								
	BB	3	141.6	1.15	0.81					Bi-Zygomaxillary	SW	23	96.8	4.02	4.15	1.31	0.596	2.43	0.023	BB	5	101.8	4.60	4.52	Nasion-Nasospinale	SW	23	51.4	2.25	4.38	3.12	0.022	0.99*	0.338	BB	12	50.2	3.98	7.92	Nasion-Prosthion	SW	22	67.6	2.88	4.26	4.50	0.003	2.24	0.032	BB	13	64.2	6.12	9.54	Nasospinale-Prosthion	SW	22	16.0	2.51	15.68	1.75	0.262	0.12	0.905	BB	12	16.1	3.32	20.57																																																																																																																																																																																																																												
Bi-Zygomaxillary	SW	23	96.8	4.02	4.15	1.31	0.596	2.43	0.023																																																																																																																																																																																																																																																																																								
	BB	5	101.8	4.60	4.52					Nasion-Nasospinale	SW	23	51.4	2.25	4.38	3.12	0.022	0.99*	0.338	BB	12	50.2	3.98	7.92	Nasion-Prosthion	SW	22	67.6	2.88	4.26	4.50	0.003	2.24	0.032	BB	13	64.2	6.12	9.54	Nasospinale-Prosthion	SW	22	16.0	2.51	15.68	1.75	0.262	0.12	0.905	BB	12	16.1	3.32	20.57																																																																																																																																																																																																																																											
Nasion-Nasospinale	SW	23	51.4	2.25	4.38	3.12	0.022	0.99*	0.338																																																																																																																																																																																																																																																																																								
	BB	12	50.2	3.98	7.92					Nasion-Prosthion	SW	22	67.6	2.88	4.26	4.50	0.003	2.24	0.032	BB	13	64.2	6.12	9.54	Nasospinale-Prosthion	SW	22	16.0	2.51	15.68	1.75	0.262	0.12	0.905	BB	12	16.1	3.32	20.57																																																																																																																																																																																																																																																										
Nasion-Prosthion	SW	22	67.6	2.88	4.26	4.50	0.003	2.24	0.032																																																																																																																																																																																																																																																																																								
	BB	13	64.2	6.12	9.54					Nasospinale-Prosthion	SW	22	16.0	2.51	15.68	1.75	0.262	0.12	0.905	BB	12	16.1	3.32	20.57																																																																																																																																																																																																																																																																									
Nasospinale-Prosthion	SW	22	16.0	2.51	15.68	1.75	0.262	0.12	0.905																																																																																																																																																																																																																																																																																								
	BB	12	16.1	3.32	20.57																																																																																																																																																																																																																																																																																												

*T calculated using separate variance estimate

		n	\bar{x}	s	CV	F	P	T	P
Orbital height	SW	23	34.2	2.29	6.70				
	BB	9	35.0	1.80	5.15	1.62	0.491	0.92	0.367
Bi-Ectoconchion	SW	21	103.6	3.46	3.35				
	BB	5	108.4	3.64	3.36	1.11	0.763	2.72	0.012
Alveolar length	SW	23	61.6	3.29	5.35				
	BB	15	61.1	3.18	5.21	1.08	0.911	0.44	0.662
Alveolar breadth	SW	23	66.6	2.77	4.17				
	BB	14	67.7	3.83	5.66	1.91	0.176	1.02	0.316
Mastoid depth	SW	22	29.2	2.81	9.61				
	BB	14	30.2	2.29	7.59	1.50	0.454	1.10	0.279

Table 56

Comparative statistics for the Murray Valley (MV) and Coobool Creek (CC) female crania (mm.)

		n	\bar{x}	s	CV	F	P	T	P
Max. Bi-Parietal breadth	MV	51	127.2	4.70	3.70				
	CC	7	132.8	6.16	4.98	1.98	0.172	2.82	0.007
Glabella-Opisthocranion	MV	52	179.8	5.02	2.80				
	CC	7	186.8	6.14	3.29	1.50	0.394	3.36	0.001
Glabella-Lambda	MV	53	174.6	4.88	2.80				
	CC	7	182.4	5.12	2.81	1.10	0.747	3.94	0.000
Basion-Bregma	MV	50	126.3	4.38	3.47				
	CC	6	138.0	6.63	4.81	2.29	0.120	5.82	0.000
Basion-Nasion	MV	50	96.2	3.92	4.08				
	CC	6	100.0	6.54	6.54	2.29	0.120	5.82	0.000
Basion-Nasospinale	MV	50	93.6	5.15	5.51				
	CC	5	96.8	2.28	2.36	5.12	0.121	1.36	0.178
Basion-Prosthion	MV	50	100.2	5.66	5.66				
	CC	5	104.0	2.55	2.45	4.94	0.128	1.47	0.146
Basion-Lambda	MV	50	108.7	4.40	4.05				
	CC	6	120.1	5.38	4.48	1.49	0.420	5.85	0.000
Basion-Inion	MV	50	73.9	7.81	10.57				
	CC	6	77.5	2.34	3.03	11.11	0.013	2.45*	0.022
Bi-Auriculare	MV	52	115.5	4.89	4.24				
	CC	7	123.4	3.64	2.95	1.80	0.471	4.10	0.000
Bi-Asterion	MV	52	105.3	3.94	3.74				
	CC	7	108.0	6.53	6.05	2.75	0.043	1.05*	0.329
Bi-Sphenion	MV	52	100.2	4.44	4.43				
	CC	6	100.6	3.77	3.75	1.38	0.783	0.023	0.818
Glabella-Bregma	MV	53	102.9	3.99	3.88				
	CC	7	109.5	4.27	3.90	1.15	0.699	4.08	0.000
Nasion-Bregma	MV	53	107.5	3.59	3.34				
	CC	7	114.1	4.25	3.73	1.41	0.461	4.48	0.000
Metopion height	MV	52	25.1	2.18	8.69				
	CC	7	23.5	4.03	17.12	3.40	0.013	1.04*	0.337
Nasion-Metopion	MV	52	47.9	3.22	6.72				
	CC	7	50.2	5.18	10.31	2.59	0.058	1.16*	0.286
Max. Supraorbital breadth	MV	53	105.2	4.12	3.92				
	CC	5	110.4	2.07	1.88	3.97	0.186	2.76	0.008
Max. Posterior Frontal br.	MV	17	106.2	3.11	2.93				
	CC	1	112.0	-	-	-	-	-	-
Min. Postorbital br.	MV	53	92.1	3.89	4.22				
	CC	6	95.8	5.19	5.42	1.78	0.266	2.11	0.039
Min. Bi-Temporal lines	MV	50	126.5	4.53	3.58				
	CC	6	93.3	8.16	8.75	4.56	0.716	2.77	0.008

*T calculated using separate variance estimate

		n	\bar{X}	s	CV	F	P	T	P
Bi-Zygion	MV	50	126.5	4.53	3.58				
	CC	6	135.5	2.12	1.57	4.56	0.716	2.77	0.008
Bi-Zygomaxillary	MV	53	90.5	4.23	4.68				
	CC	6	98.3	4.13	4.20	1.05	1.000	4.30	0.000
Bi-Stephanion	MV	50	94.0	7.01	7.46				
	CC	6	101.1	5.60	5.54	1.57	0.655	2.39	0.020
Bi-Stenionic	MV	49	67.4	3.05	4.53				
	CC	6	68.8	1.94	2.82	2.48	0.312	1.106	0.293
Opisthion-Inion	MV	49	44.1	5.85	13.27				
	CC	6	42.8	5.23	12.21	1.25	0.888	0.51	0.615
Opisthion-Lambda	MV	49	91.3	3.78	4.14				
	CC	6	100.6	2.50	2.49	2.29	0.360	5.84	0.000
Opisthion-Asterion	MV	49	62.7	3.53	5.63				
	CC	6	66.5	2.51	3.77	1.98	0.458	2.51	0.015
Opisthion-Glabella	MV	46	136.3	4.45	3.27				
	CC	6	142.5	7.96	5.60	3.20	0.030	1.85*	0.123
Foramen Magnum length	MV	48	34.2	2.21	6.45				
	CC	6	37.3	2.33	6.26	1.12	0.728	3.16	0.003
Foramen Magnum breadth	MV	48	29.3	2.13	7.25				
	CC	6	30.1	1.47	4.88	2.09	0.418	0.88	0.383
Basion-Sphenobasion	MV	50	20.7	1.73	8.33				
	CC	6	20.8	2.04	9.80	1.39	0.487	0.07	0.944
Basion-Asterion	MV	50	73.7	3.10	4.21				
	CC	6	77.8	6.96	8.95	5.04	0.002	1.44*	0.211
Basion-Mastoidale	MV	50	49.4	2.87	5.80				
	CC	6	54.0	3.09	5.74	1.16	0.681	3.63	0.001
Basion-Staphylion	MV	48	45.1	2.98	6.60				
	CC	4	46.7	2.50	5.30	1.42	0.890	1.04	0.302
Lambda-Bregma	MV	53	112.3	4.79	4.27				
	CC	7	117.0	4.54	3.88	1.11	0.996	2.44	0.018
Lambda-Inion	MV	52	59.2	5.92	10.00				
	CC	7	66.2	8.32	12.55	1.97	0.174	2.80	0.007
Lambda-Asterion	MV	52	79.4	3.60	4.54				
	CC	7	83.5	3.35	4.02	1.15	0.951	2.86	0.006
Auriculare-Bregma	MV	53	117.8	3.88	3.38				
	CC	7	126.1	4.91	3.90	1.60	0.330	5.13	0.000
Auriculare-Glabella	MV	53	112.5	4.08	3.63				
	CC	7	116.4	6.52	5.61	2.55	0.061	2.17	0.034
Auriculare-Nasion	MV	53	106.5	3.77	3.55				
	CC	7	110.4	5.53	5.01	2.15	0.127	2.44	0.018

*T calculated using separate variance estimate

		n	\bar{X}	s	CV	F	P	T	P
Auriculare-Nasospinale	MV	53	113.3	4.01	3.54				
	CC	6	119.3	4.41	3.70	1.21	0.638	3.40	0.001
Auriculare-Prosthion	MV	53	122.9	4.40	3.58				
	CC	6	128.6	5.31	4.13	1.46	0.438	2.94	0.005
Auriculare-Zygomaxillary	MV	53	74.5	3.63	4.87				
	CC	6	75.8	5.03	6.64	1.92	0.213	0.77	0.446
Auriculare-Lambda	MV	53	111.7	3.34	2.10				
	CC	7	120.4	3.55	2.95	1.12	0.722	6.38	0.000
Auriculare-Inion	MV	52	95.1	4.97	5.22				
	CC	7	96.4	2.87	2.98	2.99	0.169	0.65	0.518
Auriculare-Opisthion	MV	48	73.5	3.39	4.62				
	CC	6	78.6	2.06	2.63	2.70	0.267	3.63	0.001
Auriculare-Basion	MV	50	63.2	3.25	4.10				
	CC	6	68.1	1.94	2.85	2.64	0.277	3.75	0.000
Auriculare-Asterion	MV	53	46.0	3.34	7.25				
	CC	7	49.0	2.64	5.40	1.59	0.584	2.21	0.031
Nasion-Nasospinale	MV	53	47.3	2.54	5.37				
	CC	6	51.0	3.46	6.79	1.85	0.237	3.17	0.002
Nasion-Prosthion	MV	53	65.6	3.72	5.68				
	CC	6	69.1	4.83	6.99	1.69	0.309	2.16	0.035
Nasospinale-Prosthion	MV	53	18.2	2.86	15.74				
	CC	7	18.0	1.86	10.27	2.36	0.280	0.06	0.954
Nasal breadth	MV	53	26.4	1.92	6.55				
	CC	7	28.0	2.44	8.75	1.62	0.322	1.98	0.052
Orbital height	MV	53	32.1	1.95	6.10				
	CC	5	32.8	1.64	5.01	1.42	0.815	0.76	0.452
Orbital breadth	MV	53	42.3	1.67	3.95				
	CC	5	43.4	0.89	2.06	3.50	0.228	1.42	0.162
Bi-Ectoconchion	MV	53	99.4	3.73	3.76				
	CC	5	104.4	2.60	2.50	2.05	0.511	2.89	0.006
Frontal arc	MV	51	123.7	4.77	3.86				
	CC	7	128.5	5.56	4.33	1.36	0.500	2.47	0.017
Parietal arc	MV	51	124.6	5.77	4.63				
	CC	7	130.2	4.38	3.37	1.73	0.507	2.50	0.015
Occipital arc	MV	49	109.8	5.76	5.25				
	CC	6	119.8	3.76	3.14	2.35	0.343	4.13	0.000
Alveolar length	MV	53	59.3	3.24	5.47				
	CC	7	61.1	4.14	6.77	1.63	0.318	1.31	0.195
Alveolar breadth	MV	53	64.0	2.79	4.36				
	CC	7	67.1	2.79	4.16	1.00	0.867	2.75	0.008

		n	\bar{X}	s	CV	F	P	T	P
Mastoid depth	MV	53	27.1	2.08	7.69				
	CC	6	28.0	2.28	8.14	1.19	0.652	0.94	0.353
Bi-Canine breadth	MV	53	43.7	2.39	5.47				
	CC	7	47.4	2.44	5.14	1.04	0.822	3.81	0.000
Parietal Subtense height	MV	52	23.0	2.05	8.31				
	CC	7	24.4	1.81	7.42	1.28	0.820	1.73	0.090
Bregma-Parietal Subtense	MV	52	55.6	4.44	7.99				
	CC	7	59.2	4.15	7.00	1.15	0.955	2.02	0.048

Table 57

Comparative statistics for the Coobool Creek (CC) and Swanport (SW) female crania (mm.)

		n	\bar{X}	s	CV	F	P	T	P																																																																																																																																																																																																																																																																																								
Max. Bi-Parietal breadth	CC	7	132.8	6.61	4.98	2.49	0.103	3.10	0.004																																																																																																																																																																																																																																																																																								
	SW	25	126.5	4.19	3.31					Glabella-Opisthocranion	CC	7	186.8	6.14	3.29	1.03	0.868	2.03	0.052	SW	23	181.5	6.06	3.35	Glabella-Lambda	CC	7	182.4	5.12	2.81	1.21	0.873	3.52	0.001	SW	23	174.0	5.64	3.25	Basion-Bregma	CC	6	138.0	6.63	4.81	2.33	0.148	6.30	0.000	SW	25	124.2	4.34	3.50	Basion-Nasion	CC	6	100.0	6.54	6.54	4.48	0.100	1.52*	0.180	SW	25	95.8	3.09	3.22	Basion-Nasospinale	CC	5	96.8	2.28	2.36	3.29	0.255	1.86	0.073	SW	24	93.2	4.13	4.44	Basion-Prosthion	CC	5	104.0	2.55	2.45	2.12	0.489	2.21	0.036	SW	24	100.1	3.71	3.70	Basion-Lambda	CC	6	120.1	5.38	4.48	1.19	0.930	4.41	0.000	SW	23	108.4	5.86	3.71	Basion-Inion	CC	6	77.5	2.34	3.03	2.46	0.321	4.61	0.000	SW	22	70.1	3.68	5.25	Bi-Auriculare	CC	7	123.4	3.64	2.95	1.58	0.594	4.23	0.000	SW	22	115.3	4.58	3.97	Bi-Asterion	CC	7	108.0	6.53	6.05	2.74	0.077	1.48	0.150	SW	23	105.0	3.94	3.76	Bi-Sphenion	CC	6	100.6	3.77	3.75	1.01	0.872	1.28	0.210	SW	24	98.4	3.76	3.82	Glabella-Bregma	CC	7	109.5	4.27	3.90	1.01	1.000	3.78	0.001	SW	23	102.5	4.30	4.19	Nasion-Bregma	CC	7	114.1	4.25	3.73	1.26	0.620	4.59	0.000	SW	25	106.5	3.78	3.55	Metopion height	CC	7	23.5	4.03	17.12	4.01	0.015	2.02	0.053	SW	23	25.8	2.01	7.80	Nasion-Metopion	CC	7	50.2	5.18	10.31	2.53	0.103	2.59	0.015	SW	23	46.0	3.26	7.07	Max. Supraorbital breadth	CC	5	110.4	2.07	1.88	1.95	0.547	4.15	0.000	SW	25	104.7	2.89	2.76	Min. Postorbital breadth	CC	6	95.8	5.19	5.42	2.88	0.072	1.32	0.197	SW	25	93.7	3.06	3.26	Min. Bi-Temporal lines	CC	6	93.3	8.16	8.75	1.75	0.354	0.97	0.342	SW	18	90.2	6.17	6.83	Bi-Zygion	CC	2	135.5	2.12	1.57	6.50	0.603	2.08	0.048
Glabella-Opisthocranion	CC	7	186.8	6.14	3.29	1.03	0.868	2.03	0.052																																																																																																																																																																																																																																																																																								
	SW	23	181.5	6.06	3.35					Glabella-Lambda	CC	7	182.4	5.12	2.81	1.21	0.873	3.52	0.001	SW	23	174.0	5.64	3.25	Basion-Bregma	CC	6	138.0	6.63	4.81	2.33	0.148	6.30	0.000	SW	25	124.2	4.34	3.50	Basion-Nasion	CC	6	100.0	6.54	6.54	4.48	0.100	1.52*	0.180	SW	25	95.8	3.09	3.22	Basion-Nasospinale	CC	5	96.8	2.28	2.36	3.29	0.255	1.86	0.073	SW	24	93.2	4.13	4.44	Basion-Prosthion	CC	5	104.0	2.55	2.45	2.12	0.489	2.21	0.036	SW	24	100.1	3.71	3.70	Basion-Lambda	CC	6	120.1	5.38	4.48	1.19	0.930	4.41	0.000	SW	23	108.4	5.86	3.71	Basion-Inion	CC	6	77.5	2.34	3.03	2.46	0.321	4.61	0.000	SW	22	70.1	3.68	5.25	Bi-Auriculare	CC	7	123.4	3.64	2.95	1.58	0.594	4.23	0.000	SW	22	115.3	4.58	3.97	Bi-Asterion	CC	7	108.0	6.53	6.05	2.74	0.077	1.48	0.150	SW	23	105.0	3.94	3.76	Bi-Sphenion	CC	6	100.6	3.77	3.75	1.01	0.872	1.28	0.210	SW	24	98.4	3.76	3.82	Glabella-Bregma	CC	7	109.5	4.27	3.90	1.01	1.000	3.78	0.001	SW	23	102.5	4.30	4.19	Nasion-Bregma	CC	7	114.1	4.25	3.73	1.26	0.620	4.59	0.000	SW	25	106.5	3.78	3.55	Metopion height	CC	7	23.5	4.03	17.12	4.01	0.015	2.02	0.053	SW	23	25.8	2.01	7.80	Nasion-Metopion	CC	7	50.2	5.18	10.31	2.53	0.103	2.59	0.015	SW	23	46.0	3.26	7.07	Max. Supraorbital breadth	CC	5	110.4	2.07	1.88	1.95	0.547	4.15	0.000	SW	25	104.7	2.89	2.76	Min. Postorbital breadth	CC	6	95.8	5.19	5.42	2.88	0.072	1.32	0.197	SW	25	93.7	3.06	3.26	Min. Bi-Temporal lines	CC	6	93.3	8.16	8.75	1.75	0.354	0.97	0.342	SW	18	90.2	6.17	6.83	Bi-Zygion	CC	2	135.5	2.12	1.57	6.50	0.603	2.08	0.048	SW	23	127.3	5.40	4.25										
Glabella-Lambda	CC	7	182.4	5.12	2.81	1.21	0.873	3.52	0.001																																																																																																																																																																																																																																																																																								
	SW	23	174.0	5.64	3.25					Basion-Bregma	CC	6	138.0	6.63	4.81	2.33	0.148	6.30	0.000	SW	25	124.2	4.34	3.50	Basion-Nasion	CC	6	100.0	6.54	6.54	4.48	0.100	1.52*	0.180	SW	25	95.8	3.09	3.22	Basion-Nasospinale	CC	5	96.8	2.28	2.36	3.29	0.255	1.86	0.073	SW	24	93.2	4.13	4.44	Basion-Prosthion	CC	5	104.0	2.55	2.45	2.12	0.489	2.21	0.036	SW	24	100.1	3.71	3.70	Basion-Lambda	CC	6	120.1	5.38	4.48	1.19	0.930	4.41	0.000	SW	23	108.4	5.86	3.71	Basion-Inion	CC	6	77.5	2.34	3.03	2.46	0.321	4.61	0.000	SW	22	70.1	3.68	5.25	Bi-Auriculare	CC	7	123.4	3.64	2.95	1.58	0.594	4.23	0.000	SW	22	115.3	4.58	3.97	Bi-Asterion	CC	7	108.0	6.53	6.05	2.74	0.077	1.48	0.150	SW	23	105.0	3.94	3.76	Bi-Sphenion	CC	6	100.6	3.77	3.75	1.01	0.872	1.28	0.210	SW	24	98.4	3.76	3.82	Glabella-Bregma	CC	7	109.5	4.27	3.90	1.01	1.000	3.78	0.001	SW	23	102.5	4.30	4.19	Nasion-Bregma	CC	7	114.1	4.25	3.73	1.26	0.620	4.59	0.000	SW	25	106.5	3.78	3.55	Metopion height	CC	7	23.5	4.03	17.12	4.01	0.015	2.02	0.053	SW	23	25.8	2.01	7.80	Nasion-Metopion	CC	7	50.2	5.18	10.31	2.53	0.103	2.59	0.015	SW	23	46.0	3.26	7.07	Max. Supraorbital breadth	CC	5	110.4	2.07	1.88	1.95	0.547	4.15	0.000	SW	25	104.7	2.89	2.76	Min. Postorbital breadth	CC	6	95.8	5.19	5.42	2.88	0.072	1.32	0.197	SW	25	93.7	3.06	3.26	Min. Bi-Temporal lines	CC	6	93.3	8.16	8.75	1.75	0.354	0.97	0.342	SW	18	90.2	6.17	6.83	Bi-Zygion	CC	2	135.5	2.12	1.57	6.50	0.603	2.08	0.048	SW	23	127.3	5.40	4.25																									
Basion-Bregma	CC	6	138.0	6.63	4.81	2.33	0.148	6.30	0.000																																																																																																																																																																																																																																																																																								
	SW	25	124.2	4.34	3.50					Basion-Nasion	CC	6	100.0	6.54	6.54	4.48	0.100	1.52*	0.180	SW	25	95.8	3.09	3.22	Basion-Nasospinale	CC	5	96.8	2.28	2.36	3.29	0.255	1.86	0.073	SW	24	93.2	4.13	4.44	Basion-Prosthion	CC	5	104.0	2.55	2.45	2.12	0.489	2.21	0.036	SW	24	100.1	3.71	3.70	Basion-Lambda	CC	6	120.1	5.38	4.48	1.19	0.930	4.41	0.000	SW	23	108.4	5.86	3.71	Basion-Inion	CC	6	77.5	2.34	3.03	2.46	0.321	4.61	0.000	SW	22	70.1	3.68	5.25	Bi-Auriculare	CC	7	123.4	3.64	2.95	1.58	0.594	4.23	0.000	SW	22	115.3	4.58	3.97	Bi-Asterion	CC	7	108.0	6.53	6.05	2.74	0.077	1.48	0.150	SW	23	105.0	3.94	3.76	Bi-Sphenion	CC	6	100.6	3.77	3.75	1.01	0.872	1.28	0.210	SW	24	98.4	3.76	3.82	Glabella-Bregma	CC	7	109.5	4.27	3.90	1.01	1.000	3.78	0.001	SW	23	102.5	4.30	4.19	Nasion-Bregma	CC	7	114.1	4.25	3.73	1.26	0.620	4.59	0.000	SW	25	106.5	3.78	3.55	Metopion height	CC	7	23.5	4.03	17.12	4.01	0.015	2.02	0.053	SW	23	25.8	2.01	7.80	Nasion-Metopion	CC	7	50.2	5.18	10.31	2.53	0.103	2.59	0.015	SW	23	46.0	3.26	7.07	Max. Supraorbital breadth	CC	5	110.4	2.07	1.88	1.95	0.547	4.15	0.000	SW	25	104.7	2.89	2.76	Min. Postorbital breadth	CC	6	95.8	5.19	5.42	2.88	0.072	1.32	0.197	SW	25	93.7	3.06	3.26	Min. Bi-Temporal lines	CC	6	93.3	8.16	8.75	1.75	0.354	0.97	0.342	SW	18	90.2	6.17	6.83	Bi-Zygion	CC	2	135.5	2.12	1.57	6.50	0.603	2.08	0.048	SW	23	127.3	5.40	4.25																																								
Basion-Nasion	CC	6	100.0	6.54	6.54	4.48	0.100	1.52*	0.180																																																																																																																																																																																																																																																																																								
	SW	25	95.8	3.09	3.22					Basion-Nasospinale	CC	5	96.8	2.28	2.36	3.29	0.255	1.86	0.073	SW	24	93.2	4.13	4.44	Basion-Prosthion	CC	5	104.0	2.55	2.45	2.12	0.489	2.21	0.036	SW	24	100.1	3.71	3.70	Basion-Lambda	CC	6	120.1	5.38	4.48	1.19	0.930	4.41	0.000	SW	23	108.4	5.86	3.71	Basion-Inion	CC	6	77.5	2.34	3.03	2.46	0.321	4.61	0.000	SW	22	70.1	3.68	5.25	Bi-Auriculare	CC	7	123.4	3.64	2.95	1.58	0.594	4.23	0.000	SW	22	115.3	4.58	3.97	Bi-Asterion	CC	7	108.0	6.53	6.05	2.74	0.077	1.48	0.150	SW	23	105.0	3.94	3.76	Bi-Sphenion	CC	6	100.6	3.77	3.75	1.01	0.872	1.28	0.210	SW	24	98.4	3.76	3.82	Glabella-Bregma	CC	7	109.5	4.27	3.90	1.01	1.000	3.78	0.001	SW	23	102.5	4.30	4.19	Nasion-Bregma	CC	7	114.1	4.25	3.73	1.26	0.620	4.59	0.000	SW	25	106.5	3.78	3.55	Metopion height	CC	7	23.5	4.03	17.12	4.01	0.015	2.02	0.053	SW	23	25.8	2.01	7.80	Nasion-Metopion	CC	7	50.2	5.18	10.31	2.53	0.103	2.59	0.015	SW	23	46.0	3.26	7.07	Max. Supraorbital breadth	CC	5	110.4	2.07	1.88	1.95	0.547	4.15	0.000	SW	25	104.7	2.89	2.76	Min. Postorbital breadth	CC	6	95.8	5.19	5.42	2.88	0.072	1.32	0.197	SW	25	93.7	3.06	3.26	Min. Bi-Temporal lines	CC	6	93.3	8.16	8.75	1.75	0.354	0.97	0.342	SW	18	90.2	6.17	6.83	Bi-Zygion	CC	2	135.5	2.12	1.57	6.50	0.603	2.08	0.048	SW	23	127.3	5.40	4.25																																																							
Basion-Nasospinale	CC	5	96.8	2.28	2.36	3.29	0.255	1.86	0.073																																																																																																																																																																																																																																																																																								
	SW	24	93.2	4.13	4.44					Basion-Prosthion	CC	5	104.0	2.55	2.45	2.12	0.489	2.21	0.036	SW	24	100.1	3.71	3.70	Basion-Lambda	CC	6	120.1	5.38	4.48	1.19	0.930	4.41	0.000	SW	23	108.4	5.86	3.71	Basion-Inion	CC	6	77.5	2.34	3.03	2.46	0.321	4.61	0.000	SW	22	70.1	3.68	5.25	Bi-Auriculare	CC	7	123.4	3.64	2.95	1.58	0.594	4.23	0.000	SW	22	115.3	4.58	3.97	Bi-Asterion	CC	7	108.0	6.53	6.05	2.74	0.077	1.48	0.150	SW	23	105.0	3.94	3.76	Bi-Sphenion	CC	6	100.6	3.77	3.75	1.01	0.872	1.28	0.210	SW	24	98.4	3.76	3.82	Glabella-Bregma	CC	7	109.5	4.27	3.90	1.01	1.000	3.78	0.001	SW	23	102.5	4.30	4.19	Nasion-Bregma	CC	7	114.1	4.25	3.73	1.26	0.620	4.59	0.000	SW	25	106.5	3.78	3.55	Metopion height	CC	7	23.5	4.03	17.12	4.01	0.015	2.02	0.053	SW	23	25.8	2.01	7.80	Nasion-Metopion	CC	7	50.2	5.18	10.31	2.53	0.103	2.59	0.015	SW	23	46.0	3.26	7.07	Max. Supraorbital breadth	CC	5	110.4	2.07	1.88	1.95	0.547	4.15	0.000	SW	25	104.7	2.89	2.76	Min. Postorbital breadth	CC	6	95.8	5.19	5.42	2.88	0.072	1.32	0.197	SW	25	93.7	3.06	3.26	Min. Bi-Temporal lines	CC	6	93.3	8.16	8.75	1.75	0.354	0.97	0.342	SW	18	90.2	6.17	6.83	Bi-Zygion	CC	2	135.5	2.12	1.57	6.50	0.603	2.08	0.048	SW	23	127.3	5.40	4.25																																																																						
Basion-Prosthion	CC	5	104.0	2.55	2.45	2.12	0.489	2.21	0.036																																																																																																																																																																																																																																																																																								
	SW	24	100.1	3.71	3.70					Basion-Lambda	CC	6	120.1	5.38	4.48	1.19	0.930	4.41	0.000	SW	23	108.4	5.86	3.71	Basion-Inion	CC	6	77.5	2.34	3.03	2.46	0.321	4.61	0.000	SW	22	70.1	3.68	5.25	Bi-Auriculare	CC	7	123.4	3.64	2.95	1.58	0.594	4.23	0.000	SW	22	115.3	4.58	3.97	Bi-Asterion	CC	7	108.0	6.53	6.05	2.74	0.077	1.48	0.150	SW	23	105.0	3.94	3.76	Bi-Sphenion	CC	6	100.6	3.77	3.75	1.01	0.872	1.28	0.210	SW	24	98.4	3.76	3.82	Glabella-Bregma	CC	7	109.5	4.27	3.90	1.01	1.000	3.78	0.001	SW	23	102.5	4.30	4.19	Nasion-Bregma	CC	7	114.1	4.25	3.73	1.26	0.620	4.59	0.000	SW	25	106.5	3.78	3.55	Metopion height	CC	7	23.5	4.03	17.12	4.01	0.015	2.02	0.053	SW	23	25.8	2.01	7.80	Nasion-Metopion	CC	7	50.2	5.18	10.31	2.53	0.103	2.59	0.015	SW	23	46.0	3.26	7.07	Max. Supraorbital breadth	CC	5	110.4	2.07	1.88	1.95	0.547	4.15	0.000	SW	25	104.7	2.89	2.76	Min. Postorbital breadth	CC	6	95.8	5.19	5.42	2.88	0.072	1.32	0.197	SW	25	93.7	3.06	3.26	Min. Bi-Temporal lines	CC	6	93.3	8.16	8.75	1.75	0.354	0.97	0.342	SW	18	90.2	6.17	6.83	Bi-Zygion	CC	2	135.5	2.12	1.57	6.50	0.603	2.08	0.048	SW	23	127.3	5.40	4.25																																																																																					
Basion-Lambda	CC	6	120.1	5.38	4.48	1.19	0.930	4.41	0.000																																																																																																																																																																																																																																																																																								
	SW	23	108.4	5.86	3.71					Basion-Inion	CC	6	77.5	2.34	3.03	2.46	0.321	4.61	0.000	SW	22	70.1	3.68	5.25	Bi-Auriculare	CC	7	123.4	3.64	2.95	1.58	0.594	4.23	0.000	SW	22	115.3	4.58	3.97	Bi-Asterion	CC	7	108.0	6.53	6.05	2.74	0.077	1.48	0.150	SW	23	105.0	3.94	3.76	Bi-Sphenion	CC	6	100.6	3.77	3.75	1.01	0.872	1.28	0.210	SW	24	98.4	3.76	3.82	Glabella-Bregma	CC	7	109.5	4.27	3.90	1.01	1.000	3.78	0.001	SW	23	102.5	4.30	4.19	Nasion-Bregma	CC	7	114.1	4.25	3.73	1.26	0.620	4.59	0.000	SW	25	106.5	3.78	3.55	Metopion height	CC	7	23.5	4.03	17.12	4.01	0.015	2.02	0.053	SW	23	25.8	2.01	7.80	Nasion-Metopion	CC	7	50.2	5.18	10.31	2.53	0.103	2.59	0.015	SW	23	46.0	3.26	7.07	Max. Supraorbital breadth	CC	5	110.4	2.07	1.88	1.95	0.547	4.15	0.000	SW	25	104.7	2.89	2.76	Min. Postorbital breadth	CC	6	95.8	5.19	5.42	2.88	0.072	1.32	0.197	SW	25	93.7	3.06	3.26	Min. Bi-Temporal lines	CC	6	93.3	8.16	8.75	1.75	0.354	0.97	0.342	SW	18	90.2	6.17	6.83	Bi-Zygion	CC	2	135.5	2.12	1.57	6.50	0.603	2.08	0.048	SW	23	127.3	5.40	4.25																																																																																																				
Basion-Inion	CC	6	77.5	2.34	3.03	2.46	0.321	4.61	0.000																																																																																																																																																																																																																																																																																								
	SW	22	70.1	3.68	5.25					Bi-Auriculare	CC	7	123.4	3.64	2.95	1.58	0.594	4.23	0.000	SW	22	115.3	4.58	3.97	Bi-Asterion	CC	7	108.0	6.53	6.05	2.74	0.077	1.48	0.150	SW	23	105.0	3.94	3.76	Bi-Sphenion	CC	6	100.6	3.77	3.75	1.01	0.872	1.28	0.210	SW	24	98.4	3.76	3.82	Glabella-Bregma	CC	7	109.5	4.27	3.90	1.01	1.000	3.78	0.001	SW	23	102.5	4.30	4.19	Nasion-Bregma	CC	7	114.1	4.25	3.73	1.26	0.620	4.59	0.000	SW	25	106.5	3.78	3.55	Metopion height	CC	7	23.5	4.03	17.12	4.01	0.015	2.02	0.053	SW	23	25.8	2.01	7.80	Nasion-Metopion	CC	7	50.2	5.18	10.31	2.53	0.103	2.59	0.015	SW	23	46.0	3.26	7.07	Max. Supraorbital breadth	CC	5	110.4	2.07	1.88	1.95	0.547	4.15	0.000	SW	25	104.7	2.89	2.76	Min. Postorbital breadth	CC	6	95.8	5.19	5.42	2.88	0.072	1.32	0.197	SW	25	93.7	3.06	3.26	Min. Bi-Temporal lines	CC	6	93.3	8.16	8.75	1.75	0.354	0.97	0.342	SW	18	90.2	6.17	6.83	Bi-Zygion	CC	2	135.5	2.12	1.57	6.50	0.603	2.08	0.048	SW	23	127.3	5.40	4.25																																																																																																																			
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	SW	22	115.3	4.58	3.97					Bi-Asterion	CC	7	108.0	6.53	6.05	2.74	0.077	1.48	0.150	SW	23	105.0	3.94	3.76	Bi-Sphenion	CC	6	100.6	3.77	3.75	1.01	0.872	1.28	0.210	SW	24	98.4	3.76	3.82	Glabella-Bregma	CC	7	109.5	4.27	3.90	1.01	1.000	3.78	0.001	SW	23	102.5	4.30	4.19	Nasion-Bregma	CC	7	114.1	4.25	3.73	1.26	0.620	4.59	0.000	SW	25	106.5	3.78	3.55	Metopion height	CC	7	23.5	4.03	17.12	4.01	0.015	2.02	0.053	SW	23	25.8	2.01	7.80	Nasion-Metopion	CC	7	50.2	5.18	10.31	2.53	0.103	2.59	0.015	SW	23	46.0	3.26	7.07	Max. Supraorbital breadth	CC	5	110.4	2.07	1.88	1.95	0.547	4.15	0.000	SW	25	104.7	2.89	2.76	Min. Postorbital breadth	CC	6	95.8	5.19	5.42	2.88	0.072	1.32	0.197	SW	25	93.7	3.06	3.26	Min. Bi-Temporal lines	CC	6	93.3	8.16	8.75	1.75	0.354	0.97	0.342	SW	18	90.2	6.17	6.83	Bi-Zygion	CC	2	135.5	2.12	1.57	6.50	0.603	2.08	0.048	SW	23	127.3	5.40	4.25																																																																																																																																		
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	SW	23	102.5	4.30	4.19					Nasion-Bregma	CC	7	114.1	4.25	3.73	1.26	0.620	4.59	0.000	SW	25	106.5	3.78	3.55	Metopion height	CC	7	23.5	4.03	17.12	4.01	0.015	2.02	0.053	SW	23	25.8	2.01	7.80	Nasion-Metopion	CC	7	50.2	5.18	10.31	2.53	0.103	2.59	0.015	SW	23	46.0	3.26	7.07	Max. Supraorbital breadth	CC	5	110.4	2.07	1.88	1.95	0.547	4.15	0.000	SW	25	104.7	2.89	2.76	Min. Postorbital breadth	CC	6	95.8	5.19	5.42	2.88	0.072	1.32	0.197	SW	25	93.7	3.06	3.26	Min. Bi-Temporal lines	CC	6	93.3	8.16	8.75	1.75	0.354	0.97	0.342	SW	18	90.2	6.17	6.83	Bi-Zygion	CC	2	135.5	2.12	1.57	6.50	0.603	2.08	0.048	SW	23	127.3	5.40	4.25																																																																																																																																																																															
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	SW	23	127.3	5.40	4.25																																																																																																																																																																																																																																																																																												

*T calculated using separate variance estimate

		n	\bar{X}	s	CV	F	P	T	P
Bi-Zygomaxillary	CC	6	98.3	4.13	4.20				
	SW	25	93.7	3.47	3.70	1.42	0.508	2.82	0.008
Bi-Stephanion	CC	6	101.1	5.60	5.54				
	SW	19	95.6	6.72	7.03	1.44	0.730	1.82	0.082
Bi-Stenionic	CC	6	68.8	1.94	2.82				
	SW	22	67.0	2.59	3.87	1.79	0.538	1.52	0.140
Opisthion-Inion	CC	6	42.8	5.23	12.21				
	SW	23	39.6	7.51	18.96	2.06	0.433	0.98	0.334
Opisthion-Lambda	CC	6	100.6	2.50	2.49				
	SW	23	89.7	7.16	7.98	8.20	0.028	6.04*	0.000
Opisthion-Asterion	CC	6	66.5	2.51	3.77				
	SW	23	62.3	5.23	8.39	4.35	0.109	1.85	0.076
Opisthion-Glabella	CC	6	142.5	7.96	5.60				
	SW	21	137.0	5.40	3.94	2.18	0.196	1.94	0.063
Basion-Asterion	CC	6	77.8	6.96	8.95				
	SW	23	73.1	2.36	2.23	8.67	0.000	1.61*	0.168
Basion-Mastoidale	CC	6	54.0	3.09	5.74				
	SW	23	49.8	2.42	4.86	1.63	0.386	3.55	0.001
Basion-Staphylion	CC	4	46.7	2.50	5.35				
	SW	23	45.2	2.09	4.62	1.43	0.524	1.28	0.212
Lambda-Bregma	CC	7	117.0	4.54	3.88				
	SW	23	110.7	5.92	5.35	1.70	0.528	2.56	0.016
Lambda-Inion	CC	7	66.2	8.32	12.55				
	SW	23	62.7	7.28	11.60	1.31	0.592	1.09	0.284
Lambda-Asterion	CC	7	83.5	3.35	4.02				
	SW	23	80.7	4.39	5.43	1.71	0.524	1.54	0.134
Auriculare-Zygomaxillary	CC	6	75.8	5.03	6.64				
	SW	23	73.3	3.07	4.18	2.69	0.096	1.51	0.142
Auriculare-Opisthion	CC	6	78.6	2.06	2.63				
	SW	23	73.1	4.47	6.12	4.70	0.093	2.89	0.007
Auriculare-Basion	CC	6	68.1	1.94	2.85				
	SW	23	62.6	3.05	4.87	2.47	0.319	4.15	0.000
Nasion-Nasospinale	CC	6	51.0	3.46	6.79				
	SW	24	47.5	3.43	7.23	1.01	0.863	2.20	0.036
Nasion-Prosthion	CC	6	69.1	4.83	6.99				
	SW	24	63.2	4.29	6.74	1.27	0.622	2.76	0.010
Nasospinale-Prosthion	CC	7	18.1	1.86	10.27				
	SW	24	16.0	1.73	10.79	1.16	0.723	2.78	0.009
Nasal breadth	CC	7	28.0	2.44	8.75				
	SW	23	25.4	1.19	4.71	4.17	0.012	2.67*	0.032

*T calculated using separate variance estimate

Table 58

Comparative statistics for the Murray Valley (MV) and Swanport (SW) female crania (mm.)

		n	\bar{X}	s	CV	F	P	T	P																																																																																																																																																																																																																																																																																								
Max. Bi-Parietal breadth	MV	51	127.2	4.70	3.70	1.26	0.552	0.64	0.521																																																																																																																																																																																																																																																																																								
	SW	25	126.5	4.19	3.31					Glabella-Opisthocranion	MV	52	179.8	5.02	2.80	1.46	0.265	1.22	0.226	SW	23	181.5	6.06	3.35	Glabella-Lambda	MV	53	174.6	4.88	2.80	1.34	0.386	0.52	0.607	SW	23	174.0	5.64	3.25	Basion-Bregma	MV	50	126.3	4.38	3.47	1.02	0.998	2.00	0.049	SW	25	124.2	4.34	3.50	Basion-Nasion	MV	50	96.2	3.92	4.08	1.61	0.205	0.47	0.642	SW	25	95.8	3.09	3.22	Basion-Nasospinale	MV	50	93.6	5.15	5.51	1.55	0.252	0.32	0.746	SW	24	93.2	4.13	4.44	Basion-Prosthion	MV	50	100.2	5.66	5.66	2.33	0.030	0.07*	0.946	SW	24	100.1	3.71	3.70	Basion-Lambda	MV	50	108.7	4.40	4.05	1.77	0.097	0.24	0.808	SW	23	108.4	5.86	3.71	Basion-Inion	MV	50	73.9	7.81	10.57	4.51	0.000	2.79*	0.007	SW	22	70.1	3.68	5.25	Bi-Auriculare	MV	52	115.5	4.89	4.24	1.14	0.761	0.14	0.887	SW	22	115.3	4.58	3.97	Bi-Asterion	MV	52	105.3	3.94	3.74	1.00	0.953	0.31	0.760	SW	23	105.0	3.94	3.76	Bi-Sphenion	MV	52	100.2	4.44	4.43	1.39	0.392	1.69	0.095	SW	24	98.4	3.76	3.82	Glabella-Bregma	MV	53	100.9	3.99	3.88	1.16	0.642	0.39	0.699	SW	23	102.5	4.30	4.19	Nasion-Bregma	MV	53	107.5	3.59	3.34	1.11	0.730	1.14	0.259	SW	25	106.5	3.78	3.55	Metopion height	MV	52	25.1	2.18	8.69	1.18	0.689	1.18	0.240	SW	23	25.8	2.01	7.80	Nasion-Metopion	MV	52	47.9	3.22	6.72	1.02	0.912	2.31	0.023	SW	23	46.0	3.26	7.07	Max. Supraorbital breadth	MV	53	105.2	4.12	3.92	2.04	0.060	0.60*	0.597	SW	25	104.7	2.89	2.76	Max. Posterior Frontal br.	MV	17	106.2	3.11	2.93	9.11	0.023	1.20*	0.243	SW	6	107.3	1.03	0.96	Min. Postorbital br.	MV	53	92.1	3.89	4.22	1.62	0.202	1.75	0.084	SW	25	93.7	3.06	3.26	Min. Bi-Temporal lines	MV	50	88.6	6.08	6.87	1.03	0.892	1.00	0.321
Glabella-Opisthocranion	MV	52	179.8	5.02	2.80	1.46	0.265	1.22	0.226																																																																																																																																																																																																																																																																																								
	SW	23	181.5	6.06	3.35					Glabella-Lambda	MV	53	174.6	4.88	2.80	1.34	0.386	0.52	0.607	SW	23	174.0	5.64	3.25	Basion-Bregma	MV	50	126.3	4.38	3.47	1.02	0.998	2.00	0.049	SW	25	124.2	4.34	3.50	Basion-Nasion	MV	50	96.2	3.92	4.08	1.61	0.205	0.47	0.642	SW	25	95.8	3.09	3.22	Basion-Nasospinale	MV	50	93.6	5.15	5.51	1.55	0.252	0.32	0.746	SW	24	93.2	4.13	4.44	Basion-Prosthion	MV	50	100.2	5.66	5.66	2.33	0.030	0.07*	0.946	SW	24	100.1	3.71	3.70	Basion-Lambda	MV	50	108.7	4.40	4.05	1.77	0.097	0.24	0.808	SW	23	108.4	5.86	3.71	Basion-Inion	MV	50	73.9	7.81	10.57	4.51	0.000	2.79*	0.007	SW	22	70.1	3.68	5.25	Bi-Auriculare	MV	52	115.5	4.89	4.24	1.14	0.761	0.14	0.887	SW	22	115.3	4.58	3.97	Bi-Asterion	MV	52	105.3	3.94	3.74	1.00	0.953	0.31	0.760	SW	23	105.0	3.94	3.76	Bi-Sphenion	MV	52	100.2	4.44	4.43	1.39	0.392	1.69	0.095	SW	24	98.4	3.76	3.82	Glabella-Bregma	MV	53	100.9	3.99	3.88	1.16	0.642	0.39	0.699	SW	23	102.5	4.30	4.19	Nasion-Bregma	MV	53	107.5	3.59	3.34	1.11	0.730	1.14	0.259	SW	25	106.5	3.78	3.55	Metopion height	MV	52	25.1	2.18	8.69	1.18	0.689	1.18	0.240	SW	23	25.8	2.01	7.80	Nasion-Metopion	MV	52	47.9	3.22	6.72	1.02	0.912	2.31	0.023	SW	23	46.0	3.26	7.07	Max. Supraorbital breadth	MV	53	105.2	4.12	3.92	2.04	0.060	0.60*	0.597	SW	25	104.7	2.89	2.76	Max. Posterior Frontal br.	MV	17	106.2	3.11	2.93	9.11	0.023	1.20*	0.243	SW	6	107.3	1.03	0.96	Min. Postorbital br.	MV	53	92.1	3.89	4.22	1.62	0.202	1.75	0.084	SW	25	93.7	3.06	3.26	Min. Bi-Temporal lines	MV	50	88.6	6.08	6.87	1.03	0.892	1.00	0.321	SW	18	90.2	6.17	6.83										
Glabella-Lambda	MV	53	174.6	4.88	2.80	1.34	0.386	0.52	0.607																																																																																																																																																																																																																																																																																								
	SW	23	174.0	5.64	3.25					Basion-Bregma	MV	50	126.3	4.38	3.47	1.02	0.998	2.00	0.049	SW	25	124.2	4.34	3.50	Basion-Nasion	MV	50	96.2	3.92	4.08	1.61	0.205	0.47	0.642	SW	25	95.8	3.09	3.22	Basion-Nasospinale	MV	50	93.6	5.15	5.51	1.55	0.252	0.32	0.746	SW	24	93.2	4.13	4.44	Basion-Prosthion	MV	50	100.2	5.66	5.66	2.33	0.030	0.07*	0.946	SW	24	100.1	3.71	3.70	Basion-Lambda	MV	50	108.7	4.40	4.05	1.77	0.097	0.24	0.808	SW	23	108.4	5.86	3.71	Basion-Inion	MV	50	73.9	7.81	10.57	4.51	0.000	2.79*	0.007	SW	22	70.1	3.68	5.25	Bi-Auriculare	MV	52	115.5	4.89	4.24	1.14	0.761	0.14	0.887	SW	22	115.3	4.58	3.97	Bi-Asterion	MV	52	105.3	3.94	3.74	1.00	0.953	0.31	0.760	SW	23	105.0	3.94	3.76	Bi-Sphenion	MV	52	100.2	4.44	4.43	1.39	0.392	1.69	0.095	SW	24	98.4	3.76	3.82	Glabella-Bregma	MV	53	100.9	3.99	3.88	1.16	0.642	0.39	0.699	SW	23	102.5	4.30	4.19	Nasion-Bregma	MV	53	107.5	3.59	3.34	1.11	0.730	1.14	0.259	SW	25	106.5	3.78	3.55	Metopion height	MV	52	25.1	2.18	8.69	1.18	0.689	1.18	0.240	SW	23	25.8	2.01	7.80	Nasion-Metopion	MV	52	47.9	3.22	6.72	1.02	0.912	2.31	0.023	SW	23	46.0	3.26	7.07	Max. Supraorbital breadth	MV	53	105.2	4.12	3.92	2.04	0.060	0.60*	0.597	SW	25	104.7	2.89	2.76	Max. Posterior Frontal br.	MV	17	106.2	3.11	2.93	9.11	0.023	1.20*	0.243	SW	6	107.3	1.03	0.96	Min. Postorbital br.	MV	53	92.1	3.89	4.22	1.62	0.202	1.75	0.084	SW	25	93.7	3.06	3.26	Min. Bi-Temporal lines	MV	50	88.6	6.08	6.87	1.03	0.892	1.00	0.321	SW	18	90.2	6.17	6.83																									
Basion-Bregma	MV	50	126.3	4.38	3.47	1.02	0.998	2.00	0.049																																																																																																																																																																																																																																																																																								
	SW	25	124.2	4.34	3.50					Basion-Nasion	MV	50	96.2	3.92	4.08	1.61	0.205	0.47	0.642	SW	25	95.8	3.09	3.22	Basion-Nasospinale	MV	50	93.6	5.15	5.51	1.55	0.252	0.32	0.746	SW	24	93.2	4.13	4.44	Basion-Prosthion	MV	50	100.2	5.66	5.66	2.33	0.030	0.07*	0.946	SW	24	100.1	3.71	3.70	Basion-Lambda	MV	50	108.7	4.40	4.05	1.77	0.097	0.24	0.808	SW	23	108.4	5.86	3.71	Basion-Inion	MV	50	73.9	7.81	10.57	4.51	0.000	2.79*	0.007	SW	22	70.1	3.68	5.25	Bi-Auriculare	MV	52	115.5	4.89	4.24	1.14	0.761	0.14	0.887	SW	22	115.3	4.58	3.97	Bi-Asterion	MV	52	105.3	3.94	3.74	1.00	0.953	0.31	0.760	SW	23	105.0	3.94	3.76	Bi-Sphenion	MV	52	100.2	4.44	4.43	1.39	0.392	1.69	0.095	SW	24	98.4	3.76	3.82	Glabella-Bregma	MV	53	100.9	3.99	3.88	1.16	0.642	0.39	0.699	SW	23	102.5	4.30	4.19	Nasion-Bregma	MV	53	107.5	3.59	3.34	1.11	0.730	1.14	0.259	SW	25	106.5	3.78	3.55	Metopion height	MV	52	25.1	2.18	8.69	1.18	0.689	1.18	0.240	SW	23	25.8	2.01	7.80	Nasion-Metopion	MV	52	47.9	3.22	6.72	1.02	0.912	2.31	0.023	SW	23	46.0	3.26	7.07	Max. Supraorbital breadth	MV	53	105.2	4.12	3.92	2.04	0.060	0.60*	0.597	SW	25	104.7	2.89	2.76	Max. Posterior Frontal br.	MV	17	106.2	3.11	2.93	9.11	0.023	1.20*	0.243	SW	6	107.3	1.03	0.96	Min. Postorbital br.	MV	53	92.1	3.89	4.22	1.62	0.202	1.75	0.084	SW	25	93.7	3.06	3.26	Min. Bi-Temporal lines	MV	50	88.6	6.08	6.87	1.03	0.892	1.00	0.321	SW	18	90.2	6.17	6.83																																								
Basion-Nasion	MV	50	96.2	3.92	4.08	1.61	0.205	0.47	0.642																																																																																																																																																																																																																																																																																								
	SW	25	95.8	3.09	3.22					Basion-Nasospinale	MV	50	93.6	5.15	5.51	1.55	0.252	0.32	0.746	SW	24	93.2	4.13	4.44	Basion-Prosthion	MV	50	100.2	5.66	5.66	2.33	0.030	0.07*	0.946	SW	24	100.1	3.71	3.70	Basion-Lambda	MV	50	108.7	4.40	4.05	1.77	0.097	0.24	0.808	SW	23	108.4	5.86	3.71	Basion-Inion	MV	50	73.9	7.81	10.57	4.51	0.000	2.79*	0.007	SW	22	70.1	3.68	5.25	Bi-Auriculare	MV	52	115.5	4.89	4.24	1.14	0.761	0.14	0.887	SW	22	115.3	4.58	3.97	Bi-Asterion	MV	52	105.3	3.94	3.74	1.00	0.953	0.31	0.760	SW	23	105.0	3.94	3.76	Bi-Sphenion	MV	52	100.2	4.44	4.43	1.39	0.392	1.69	0.095	SW	24	98.4	3.76	3.82	Glabella-Bregma	MV	53	100.9	3.99	3.88	1.16	0.642	0.39	0.699	SW	23	102.5	4.30	4.19	Nasion-Bregma	MV	53	107.5	3.59	3.34	1.11	0.730	1.14	0.259	SW	25	106.5	3.78	3.55	Metopion height	MV	52	25.1	2.18	8.69	1.18	0.689	1.18	0.240	SW	23	25.8	2.01	7.80	Nasion-Metopion	MV	52	47.9	3.22	6.72	1.02	0.912	2.31	0.023	SW	23	46.0	3.26	7.07	Max. Supraorbital breadth	MV	53	105.2	4.12	3.92	2.04	0.060	0.60*	0.597	SW	25	104.7	2.89	2.76	Max. Posterior Frontal br.	MV	17	106.2	3.11	2.93	9.11	0.023	1.20*	0.243	SW	6	107.3	1.03	0.96	Min. Postorbital br.	MV	53	92.1	3.89	4.22	1.62	0.202	1.75	0.084	SW	25	93.7	3.06	3.26	Min. Bi-Temporal lines	MV	50	88.6	6.08	6.87	1.03	0.892	1.00	0.321	SW	18	90.2	6.17	6.83																																																							
Basion-Nasospinale	MV	50	93.6	5.15	5.51	1.55	0.252	0.32	0.746																																																																																																																																																																																																																																																																																								
	SW	24	93.2	4.13	4.44					Basion-Prosthion	MV	50	100.2	5.66	5.66	2.33	0.030	0.07*	0.946	SW	24	100.1	3.71	3.70	Basion-Lambda	MV	50	108.7	4.40	4.05	1.77	0.097	0.24	0.808	SW	23	108.4	5.86	3.71	Basion-Inion	MV	50	73.9	7.81	10.57	4.51	0.000	2.79*	0.007	SW	22	70.1	3.68	5.25	Bi-Auriculare	MV	52	115.5	4.89	4.24	1.14	0.761	0.14	0.887	SW	22	115.3	4.58	3.97	Bi-Asterion	MV	52	105.3	3.94	3.74	1.00	0.953	0.31	0.760	SW	23	105.0	3.94	3.76	Bi-Sphenion	MV	52	100.2	4.44	4.43	1.39	0.392	1.69	0.095	SW	24	98.4	3.76	3.82	Glabella-Bregma	MV	53	100.9	3.99	3.88	1.16	0.642	0.39	0.699	SW	23	102.5	4.30	4.19	Nasion-Bregma	MV	53	107.5	3.59	3.34	1.11	0.730	1.14	0.259	SW	25	106.5	3.78	3.55	Metopion height	MV	52	25.1	2.18	8.69	1.18	0.689	1.18	0.240	SW	23	25.8	2.01	7.80	Nasion-Metopion	MV	52	47.9	3.22	6.72	1.02	0.912	2.31	0.023	SW	23	46.0	3.26	7.07	Max. Supraorbital breadth	MV	53	105.2	4.12	3.92	2.04	0.060	0.60*	0.597	SW	25	104.7	2.89	2.76	Max. Posterior Frontal br.	MV	17	106.2	3.11	2.93	9.11	0.023	1.20*	0.243	SW	6	107.3	1.03	0.96	Min. Postorbital br.	MV	53	92.1	3.89	4.22	1.62	0.202	1.75	0.084	SW	25	93.7	3.06	3.26	Min. Bi-Temporal lines	MV	50	88.6	6.08	6.87	1.03	0.892	1.00	0.321	SW	18	90.2	6.17	6.83																																																																						
Basion-Prosthion	MV	50	100.2	5.66	5.66	2.33	0.030	0.07*	0.946																																																																																																																																																																																																																																																																																								
	SW	24	100.1	3.71	3.70					Basion-Lambda	MV	50	108.7	4.40	4.05	1.77	0.097	0.24	0.808	SW	23	108.4	5.86	3.71	Basion-Inion	MV	50	73.9	7.81	10.57	4.51	0.000	2.79*	0.007	SW	22	70.1	3.68	5.25	Bi-Auriculare	MV	52	115.5	4.89	4.24	1.14	0.761	0.14	0.887	SW	22	115.3	4.58	3.97	Bi-Asterion	MV	52	105.3	3.94	3.74	1.00	0.953	0.31	0.760	SW	23	105.0	3.94	3.76	Bi-Sphenion	MV	52	100.2	4.44	4.43	1.39	0.392	1.69	0.095	SW	24	98.4	3.76	3.82	Glabella-Bregma	MV	53	100.9	3.99	3.88	1.16	0.642	0.39	0.699	SW	23	102.5	4.30	4.19	Nasion-Bregma	MV	53	107.5	3.59	3.34	1.11	0.730	1.14	0.259	SW	25	106.5	3.78	3.55	Metopion height	MV	52	25.1	2.18	8.69	1.18	0.689	1.18	0.240	SW	23	25.8	2.01	7.80	Nasion-Metopion	MV	52	47.9	3.22	6.72	1.02	0.912	2.31	0.023	SW	23	46.0	3.26	7.07	Max. Supraorbital breadth	MV	53	105.2	4.12	3.92	2.04	0.060	0.60*	0.597	SW	25	104.7	2.89	2.76	Max. Posterior Frontal br.	MV	17	106.2	3.11	2.93	9.11	0.023	1.20*	0.243	SW	6	107.3	1.03	0.96	Min. Postorbital br.	MV	53	92.1	3.89	4.22	1.62	0.202	1.75	0.084	SW	25	93.7	3.06	3.26	Min. Bi-Temporal lines	MV	50	88.6	6.08	6.87	1.03	0.892	1.00	0.321	SW	18	90.2	6.17	6.83																																																																																					
Basion-Lambda	MV	50	108.7	4.40	4.05	1.77	0.097	0.24	0.808																																																																																																																																																																																																																																																																																								
	SW	23	108.4	5.86	3.71					Basion-Inion	MV	50	73.9	7.81	10.57	4.51	0.000	2.79*	0.007	SW	22	70.1	3.68	5.25	Bi-Auriculare	MV	52	115.5	4.89	4.24	1.14	0.761	0.14	0.887	SW	22	115.3	4.58	3.97	Bi-Asterion	MV	52	105.3	3.94	3.74	1.00	0.953	0.31	0.760	SW	23	105.0	3.94	3.76	Bi-Sphenion	MV	52	100.2	4.44	4.43	1.39	0.392	1.69	0.095	SW	24	98.4	3.76	3.82	Glabella-Bregma	MV	53	100.9	3.99	3.88	1.16	0.642	0.39	0.699	SW	23	102.5	4.30	4.19	Nasion-Bregma	MV	53	107.5	3.59	3.34	1.11	0.730	1.14	0.259	SW	25	106.5	3.78	3.55	Metopion height	MV	52	25.1	2.18	8.69	1.18	0.689	1.18	0.240	SW	23	25.8	2.01	7.80	Nasion-Metopion	MV	52	47.9	3.22	6.72	1.02	0.912	2.31	0.023	SW	23	46.0	3.26	7.07	Max. Supraorbital breadth	MV	53	105.2	4.12	3.92	2.04	0.060	0.60*	0.597	SW	25	104.7	2.89	2.76	Max. Posterior Frontal br.	MV	17	106.2	3.11	2.93	9.11	0.023	1.20*	0.243	SW	6	107.3	1.03	0.96	Min. Postorbital br.	MV	53	92.1	3.89	4.22	1.62	0.202	1.75	0.084	SW	25	93.7	3.06	3.26	Min. Bi-Temporal lines	MV	50	88.6	6.08	6.87	1.03	0.892	1.00	0.321	SW	18	90.2	6.17	6.83																																																																																																				
Basion-Inion	MV	50	73.9	7.81	10.57	4.51	0.000	2.79*	0.007																																																																																																																																																																																																																																																																																								
	SW	22	70.1	3.68	5.25					Bi-Auriculare	MV	52	115.5	4.89	4.24	1.14	0.761	0.14	0.887	SW	22	115.3	4.58	3.97	Bi-Asterion	MV	52	105.3	3.94	3.74	1.00	0.953	0.31	0.760	SW	23	105.0	3.94	3.76	Bi-Sphenion	MV	52	100.2	4.44	4.43	1.39	0.392	1.69	0.095	SW	24	98.4	3.76	3.82	Glabella-Bregma	MV	53	100.9	3.99	3.88	1.16	0.642	0.39	0.699	SW	23	102.5	4.30	4.19	Nasion-Bregma	MV	53	107.5	3.59	3.34	1.11	0.730	1.14	0.259	SW	25	106.5	3.78	3.55	Metopion height	MV	52	25.1	2.18	8.69	1.18	0.689	1.18	0.240	SW	23	25.8	2.01	7.80	Nasion-Metopion	MV	52	47.9	3.22	6.72	1.02	0.912	2.31	0.023	SW	23	46.0	3.26	7.07	Max. Supraorbital breadth	MV	53	105.2	4.12	3.92	2.04	0.060	0.60*	0.597	SW	25	104.7	2.89	2.76	Max. Posterior Frontal br.	MV	17	106.2	3.11	2.93	9.11	0.023	1.20*	0.243	SW	6	107.3	1.03	0.96	Min. Postorbital br.	MV	53	92.1	3.89	4.22	1.62	0.202	1.75	0.084	SW	25	93.7	3.06	3.26	Min. Bi-Temporal lines	MV	50	88.6	6.08	6.87	1.03	0.892	1.00	0.321	SW	18	90.2	6.17	6.83																																																																																																																			
Bi-Auriculare	MV	52	115.5	4.89	4.24	1.14	0.761	0.14	0.887																																																																																																																																																																																																																																																																																								
	SW	22	115.3	4.58	3.97					Bi-Asterion	MV	52	105.3	3.94	3.74	1.00	0.953	0.31	0.760	SW	23	105.0	3.94	3.76	Bi-Sphenion	MV	52	100.2	4.44	4.43	1.39	0.392	1.69	0.095	SW	24	98.4	3.76	3.82	Glabella-Bregma	MV	53	100.9	3.99	3.88	1.16	0.642	0.39	0.699	SW	23	102.5	4.30	4.19	Nasion-Bregma	MV	53	107.5	3.59	3.34	1.11	0.730	1.14	0.259	SW	25	106.5	3.78	3.55	Metopion height	MV	52	25.1	2.18	8.69	1.18	0.689	1.18	0.240	SW	23	25.8	2.01	7.80	Nasion-Metopion	MV	52	47.9	3.22	6.72	1.02	0.912	2.31	0.023	SW	23	46.0	3.26	7.07	Max. Supraorbital breadth	MV	53	105.2	4.12	3.92	2.04	0.060	0.60*	0.597	SW	25	104.7	2.89	2.76	Max. Posterior Frontal br.	MV	17	106.2	3.11	2.93	9.11	0.023	1.20*	0.243	SW	6	107.3	1.03	0.96	Min. Postorbital br.	MV	53	92.1	3.89	4.22	1.62	0.202	1.75	0.084	SW	25	93.7	3.06	3.26	Min. Bi-Temporal lines	MV	50	88.6	6.08	6.87	1.03	0.892	1.00	0.321	SW	18	90.2	6.17	6.83																																																																																																																																		
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*T calculated using separate variance estimate

		n	\bar{X}	s	CV	F	P	T	P
Bi-Zygion	MV	50	126.5	4.53	3.58				
	SW	23	127.3	5.40	4.25	1.42	0.302	0.68	0.498
Bi-Zygomaxillary	MV	53	90.5	4.23	4.68				
	SW	25	93.7	3.47	3.70	1.49	0.288	3.30	0.001
Bi-Stephanion	MV	50	94.0	7.01	7.46				
	SW	19	95.6	6.72	7.03	1.09	0.879	0.85	0.398
Bi-Stenionic	MV	49	67.4	3.05	4.53				
	SW	22	67.0	2.59	3.87	1.38	0.423	0.50	0.616
Opisthion-Inion	MV	49	44.1	5.85	13.27				
	SW	23	39.6	7.51	19.96	1.65	0.149	2.77	0.007
Opisthion-Lambda	MV	49	91.3	3.78	4.14				
	SW	23	89.7	7.16	7.98	3.59	0.000	1.02*	0.314
Opisthion-Asterion	MV	49	62.7	3.53	5.63				
	SW	23	62.3	5.23	8.39	2.20	0.023	0.30*	0.764
Opisthion-Glabella	MV	46	136.3	4.45	3.27				
	SW	21	137.0	5.40	3.94	1.47	0.280	0.60	0.554
Basion-Asterion	MV	50	73.7	3.10	4.21				
	SW	23	73.1	2.36	2.23	1.72	0.167	0.72	0.473
Basion-Mastoidale	MV	50	49.4	2.87	5.80				
	SW	23	49.8	2.42	4.86	1.40	0.389	0.53	0.598
Basion-Staphylion	MV	48	45.1	2.98	6.60				
	SW	23	45.2	2.09	4.62	2.03	0.074	0.17	0.869
Lambda-Bregma	MV	53	112.3	4.79	4.27				
	SW	23	110.7	5.92	5.35	1.53	0.210	1.23	0.223
Lambda-Inion	MV	52	59.2	5.92	10.00				
	SW	23	62.7	7.28	11.60	1.51	0.226	2.18	0.033
Lambda-Asterion	MV	52	79.4	3.60	4.54				
	SW	23	80.7	4.39	5.43	1.48	0.247	1.39	0.170
Auriculare-Zygomaxillary	MV	53	74.5	3.63	4.87				
	SW	23	73.3	3.07	4.18	1.40	0.390	1.38	0.173
Auriculare-Opisthion	MV	48	73.5	3.39	4.62				
	SW	23	73.1	4.47	6.12	1.74	0.112	0.34	0.734
Auriculare-Basion	MV	50	63.2	3.15	4.10				
	SW	23	62.6	3.05	4.87	1.07	0.891	0.64	0.524
Nasion-Nasospinale	MV	53	47.3	2.54	5.37				
	SW	24	47.5	3.43	7.23	1.83	0.073	0.21	0.836
Nasion-Prosthion	MV	53	65.6	3.72	5.68				
	SW	24	63.6	4.29	6.74	1.33	0.392	2.06	0.043
Nasospinale-Prosthion	MV	53	18.2	2.86	15.74				
	SW	24	16.0	1.73	10.79	2.74	0.010	4.09*	0.000

*T calculated using separate variance estimate

		n	\bar{X}	s	CV	F	P	T	P																																																																																																																																																																															
Nasal breadth	MV	53	26.4	1.92	6.55	2.58	0.017	2.69*	0.009																																																																																																																																																																															
	SW	23	25.4	1.19	4.71					Orbital height	MV	53	32.1	1.95	6.10	1.21	0.628	2.96	0.004	SW	25	33.4	1.78	5.32	Orbital breadth	MV	53	42.3	1.67	3.95	2.01	0.075	0.49	0.623	SW	23	42.1	1.18	2.80	Bi-Ectoconchion	MV	53	99.4	3.73	3.76	1.24	0.582	0.58	0.565	SW	25	99.9	3.36	3.36	Frontal arc	MV	51	123.7	4.77	4.29	1.07	0.808	0.73	0.470	SW	20	122.8	4.94	4.03	Parietal arc	MV	51	124.6	5.77	4.63	1.38	0.344	0.95	0.347	SW	22	123.1	6.79	5.52	Occipital arc	MV	49	109.8	5.76	5.25	1.12	0.718	0.91	0.364	SW	23	111.1	6.11	5.49	Alveolar length	MV	53	59.3	3.24	5.47	2.58	0.013	2.95*	0.004	SW	25	57.6	2.02	3.50	Alveolar breadth	MV	53	64.0	2.79	4.36	1.05	0.864	2.55	0.013	SW	25	62.3	2.85	4.58	Mastoid depth	MV	53	27.1	2.08	7.69	1.36	0.355	4.40	0.000	SW	25	24.0	2.43	9.80	Bi-Canine breadth	MV	53	43.7	2.39	5.47	1.36	0.440	1.39	0.168	SW	23	42.9	2.05	4.78	Parietal Subtense height	MV	52	23.0	2.05	8.92	1.44	0.285	0.44	0.658	SW	22	22.7	2.46	10.84	Bregma-Parietal Subtense	MV	52	55.6	4.44	7.99	1.30	0.437	1.99	0.050
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4.2 Artificial cranial deformation

The extremes of morphological variation in Australian Aboriginal crania have long fueled debate as to the biological origins of the Australian Aboriginal population (Topinard, 1872; Turner, 1884; Keith, 1925; Wood Jones, 1934a; Campbell, *et al.*, 1936; Howells, 1937; Fenner, 1939; Wunderly, 1943; Birdsell, 1949, 1967; Abbie, 1951; Macintosh, 1963; Thorne, 1975; Larnach, 1978; Freedman and Lofgren, 1979b; Thorne and Wolpoff, 1981). A factor central to the debate is the shape and development of the fronto-facial area. It was specifically in relation to this area that Weidenreich (1946) suggested that the osteological details of some recent and prehistoric Aboriginal crania are evidence of a continuous line of evolution from the Indonesian Pithecanthropine forms.

Thorne (1975) concluded that the diagnostic features of the Kow Swamp crania support Weidenreich's statements. In particular, he suggested that the overall form of the frontal bones of some individuals points directly to Pleistocene Southeast Asia. Thorne's comparison of the Kow Swamp crania with a 'modern' Murray Valley series demonstrated that the morphological and metrical features that distinguish the two series are concentrated on the face and forehead. Of the 15 statistically significant metrical differences between the two male groups, 12 relate to the facial and frontal areas. Compared to the Victorian comparative series, the Kow Swamp male frontal bones are flattened, broader anteriorly and longer anteroposteriorly.

A contrasting interpretation of the Kow Swamp and Cohuna crania by Brothwell (1975) suggested that the frontal recession evident in the Kow Swamp material was in fact too extreme to be natural and represented artificial

deformation rather than the persistence to 10,000 years BP of an archaic morphotype. Thorne's reply (1976), supported by Larnach (1978), observed that there were no structural osteological characters in the Kow Swamp crania that would support deformation. Thorne argued that given the extreme anterior recession, some corresponding posterior reaction should be observable. He found none: 'indeed the occipital region of the Kow Swamp cranium was fully developed and expanded' (Thorne, 1976:110).

A detailed descriptive comparison between the Kow Swamp-Cohuna crania and an artificially deformed series has not previously been undertaken. Initially, given the fragmentary material available, and especially the poor preservation of the basi-occipital area in the Kow Swamp material, it is unlikely that conclusive results could have been obtained. The reconstruction of the Coobool crania provided an opportunity to test this issue, as statistical and morphological comparisons indicate that these crania fall within the Kow Swamp range. In this analysis the Coobool Creek, Kow Swamp and Cohuna crania are compared with a series of artificially deformed crania from the Arawe of southern New Britain (Blackwood and Danby, 1955).

Materials

For this analysis it would have been preferable to compare deformed and undeformed crania from the same biological population. However, the material simply is not available. The sample can be subdivided into two subsets, Australian Aboriginal and Melanesian crania. The only definitely deformed crania available were Melanesian. Due to the morphological difference between Australian and Melanesian crania, a direct comparison of deformed Melanesian crania with undeformed Australian Aboriginal crania would have

produced data which could have been difficult to interpret. Therefore the initial comparison was made between the artificially deformed Melanesian series (the Arawe) and an undeformed Melanesian series (Sepik River). These data were then compared with that from the three Australian Aboriginal cranial series (Kow Swamp-Cohuna, Coobool Creek and the Murray Valley series). Data from all crania were used for the initial analysis but only the male data are presented in detail here. This is because in the Arawe, Sepik River and Coobool material there were not enough females for statistically significant comparisons.

The Arawe

A total of 57 artificially deformed crania in the collections of the Anatomy Department of Melbourne University, the South Australian Museum and the Australian Institute of Anatomy was examined. The Arawe of southern New Britain, forming the largest (n=25) well defined unit within this collection, were chosen as the representative artificially deformed sample.

Sex was determined through a detailed examination of cranial morphology (Krogman, 1962; Larnach and Freedman, 1964). I would have liked to test the diagnosis by using the Giles and Elliot (1963) discriminant function technique but the degree of deformation suggests that the results would have been even less reliable than the original morphological sexing. This suggested that 16 male crania and nine female crania were present, but the subjective nature of morphological sexing does not preclude error.

Blackwood and Danby (1955) present a detailed description of both the process of head binding among the Arawe and its effect on the cranial vault. According to them the motive for head binding appears to be a purely aesthetic one - the long head was admired and considered attractive to the opposite sex. They describe how almost immediately after birth a bandage consisting of strips of bark cloth and vine was bound around the infant's forehead and back of the cranium. The first bandage served for about 3 weeks, larger pieces being substituted as the child grew. The amount of deformation produced was left entirely to the discretion of the mother, who kept the bandage fastened tightly if she wished the child's head to be particularly long. Even at one day old deformation was quite marked. The bandage was kept on for about a year. Reasons given for discontinuing the practice were the child's head was considered long enough or that the child kept pulling the bandage off.

Sepik River

The largest regional Melanesian series approximating a population that could be obtained from collections in Melbourne, Adelaide and Canberra consisted of 26 crania with incised frontal bones from the Sepik River area of northern New Guinea. There are no known ethnographic records of artificial deformation being practised in the Sepik (Dingwall, 1931) and the crania show no evidence of deformation.

Sex was determined through an examination of cranial morphology (Krogman, 1962; Larnach and Freedman, 1964) and a discriminant function analysis of the crania and mandibles (Giles and Elliot, 1963; Giles, 1964).

Close agreement was obtained between the morphological and metrical techniques. In the five instances where crania obtained intermediate discriminant function scores, greatest emphasis was placed on morphological characteristics. Fourteen male crania and 12 female crania were sexed by these analyses.

Methods

All dimensions were taken to standard osteological points, as defined in Section 2, and measured to the nearest millimetre. Snedecor's variance ratio test (F value) was used to test differences between sample variances and Student's t test to assess differences in sample means. The distribution of these data was compared to the normal distribution using the Shapiro-Wilk statistic (W). Correlation matrices were generated using the convention of pairwise deletion of missing data. Linear discriminant analysis of selected variables was undertaken using a stepwise method which maximised the Mahalanobis distance between groups (SPSS package DISCRIMINANT, method MAHAL) (Nie, *et al.*, 1975). Covariance matrices were produced for each group and a test for equality of the matrices, Box's M and its associated F test, employed (Box, 1949).

Lateral radiographs were taken of eight of the Arawe and all of the Coobool crania. Heavy mineralisation of the latter resulted in comparatively low resolution. These radiographs were compared with a series of radiographs of Australian Aboriginals taken as part of the long-term growth study of Walbiri and Pintubi people at Yuendumu (Brown and Barrett, 1971, 1973; Brown, *et al.*, 1979).

Univariate and morphological comparison

1. Arawe and Sepik River

The descriptive statistical data for the Arawe and Sepik River male crania are presented in Table 59.

Compared to the Sepik River frontal bones, the Arawe frontals are greatly elongated and flattened. Both the mean frontal chord (nasion-bregma) and frontal arc length of the deformed crania are significantly longer ($P=.000$, $P=.048$) than in the undeformed series.

Viewed laterally, the flattening of the Arawe frontals is largely restricted to the anterior two-thirds, with the surface in some crania being slightly concave. There is little evidence of the frontal boss preserved and the point of maximum convexity (metopion) is situated posterior to that in the Sepik series. The mean frontal curvature index of the Arawe is significantly lower than that in the undeformed series, with only a slight overlap between the two ranges. There are no significant differences in supra-orbital breadth.

Magitot (1885) found that artificially deformed European crania were often distinguished by a marked pre-bregmatic bulge or eminence and a series of lateral depressions bordering the midline, halfway between nasion and bregma. Marked pre-bregmatic eminences are present in four of the Arawe male crania, with slight bulges in five others. Lateral depressions bordering the midline, sometimes two on each side, are well developed in seven of the males. These features are not present in any of the undeformed Melanesian crania examined.

Table 59. Comparative dimensions of the Arawe and Sepik River male crania (mm.)

	ARAWE MALES				SEPIK RIVER MALES				F	P	T	P
	n.	\bar{X}	s	Range	n.	\bar{X}	s	Range				
Max.Bi-Parietal breadth	14	126.4	4.57	119-133	14	132.0	5.51	120-140	1.45	.511	-2.91	.007*
Glabella-Opisthocranion	16	183.9	6.04	169-193	14	180.9	7.12	170-192	1.39	.537	1.24	.225
Basion-Bregma	16	140.6	5.55	133-151	14	134.1	4.99	123-141	1.24	.708	3.37	.002*
Basion-Nasion	16	102.9	3.79	96-110	14	100.7	3.93	95-107	1.07	.885	1.53	.138
Basion-Nasospinale	16	100.1	4.03	92-108	14	97.6	3.71	90-106	1.18	.770	1.79	.085
Basion-Prosthion	11	105.8	4.29	100-113	14	102.6	3.97	96-111	1.16	.783	1.90	.071
Basion-Lambda	16	122.7	8.67	102-131	14	109.8	7.67	93-118	1.28	.666	4.33	.000*
Basion-Inion	16	67.0	10.46	41-79	14	67.1	11.46	29-77	1.20	.730	-0.04	.972
Bi-Auricular breadth	16	122.3	5.99	113-133	14	118.1	5.01	108-124	1.44	.519	2.08	.047*
Fronto-Sphenoid breadth	16	105.8	5.88	91-111	14	103.3	3.04	96-118	1.11	.857	1.20	.241
Nasion-Bregma	16	118.9	3.98	111-126	14	111.4	2.90	105-117	1.89	.257	5.96	.000*
Metopion height	16	17.2	2.78	13-22	14	23.2	3.02	19-29	1.17	.760	-5.66	.000*
Nasion-Metopion	16	58.2	11.66	41-83	14	46.8	10.76	10-53	1.17	.781	2.78	.010*
Max.anterior Frontal breadth	16	106.4	4.68	98-118	14	107.0	5.88	96-116	1.58	.392	-0.29	.776
Bi-Zygion	16	135.4	6.33	125-147	14	131.0	5.56	123-143	1.29	.650	2.01	.054
Bi-Zygomaxillary	16	99.0	5.48	86-103	14	95.1	5.62	90-109	1.05	.917	1.90	.068
Opisthion-Lambda	16	102.7	4.29	96-113	14	93.2	3.58	90-102	1.43	.519	6.60	.000*
Basion-Staphylion	16	50.2	3.58	45-57	13	47.5	3.15	43-53	1.29	.664	2.12	.044*
Bregma-Lambda	16	111.1	6.18	99-120	14	115.7	7.46	105-132	1.46	.482	-1.84	.077
Lambda-Inion	16	73.1	9.41	58-98	14	65.4	5.40	56-76	3.03	.050*	2.82	.010*
Lambda-Asterion	16	85.5	6.28	75-96	14	81.0	4.04	75-88	2.42	.117	2.36	.026*
Auriculare-Opisthion	16	76.8	4.24	69-85	14	73.5	2.82	66-77	2.25	.149	2.50	.019*
Auriculare-Basion	16	67.1	3.59	60-73	14	63.7	2.84	57-67	1.59	.404	2.85	.008*
Nasion-Nasospinale	16	55.9	2.60	50-59	14	53.6	3.25	49-59	1.56	.410	2.06	.050*
Nasion-Prosthion	12	71.5	4.60	65-82	14	69.9	3.99	64-77	1.33	.621	0.96	.346
Orbital height	16	36.7	1.66	34-39	14	34.4	2.53	29-37	2.32	.122	2.94	.008*
Bi-Ectoconchion	16	102.1	4.05	95-112	14	100.2	5.06	91-108	1.56	.407	1.13	.268
Frontal arc	16	128.6	5.24	120-138	14	125.1	3.94	120-134	1.77	.308	2.07	.048*
Parietal arc	16	132.0	7.87	112-145	14	131.6	8.97	118-151	1.30	.624	0.14	.891
Occipital arc	16	113.5	4.56	106-123	14	109.6	5.71	99-120	1.57	.403	2.06	.050*
Parietal subtense height	16	31.1	3.54	22-37	14	26.4	2.93	21-31	1.46	.499	3.98	.001*
Bregma-subtense	16	60.3	4.25	55-68	14	58.4	5.56	51-70	1.71	.321	1.03	.313
Frontal Curvature Index	16	14.5	1.84	11-18	14	20.9	2.27	17-26	1.56	.410	7.93	.000*
Parietal Curvature Index	16	28.8	3.12	22-33	14	22.9	1.73	20-27	3.18	.049*	5.69	.000*
Occipital Curvature Index	16	19.2	3.32	13-24	14	26.0	4.47	20-34	1.87	.253	4.36	.000*
Gnathic Index	13	103.9	5.17	99-116	14	101.7	2.93	97-107	3.07	.050*	1.19	.213
Foramen Magnum-Nasion	16	146.2	5.61	138-158	14	155.4	4.58	148-161	1.47	.483	4.37	.000*

*Probability level of .059-.000 considered significant

With head binding the depth of the post-orbital ophrionic groove appears to be slightly increased, giving a superficial impression of a frontal torus in the more robust males. A large glabella, relative to other Melanesian populations, is a feature of male crania from New Britain (Bonin, 1936) and this persists in the deformed crania. There is no apparent change in the size of the superciliary ridges with deformation.

Larnach (1974) demonstrated that in artificially deformed crania pressure on the frontal resulted in an increase of curvature in the parietals. This change can be measured through the parietal curvature index. For this index the parietal chord (straight-line distance from bregma to lambda) and the parietal subtense (maximum perpendicular distance from the parietal chord to the maximum projection of the parietal curvature) are measured with coordinate calipers. Larnach found that the mean parietal curvature index of his deformed series was significantly higher than that for undeformed crania and there was no overlap in range. He argued that this index could therefore be used to distinguish between deformed and undeformed crania. Although in this study the mean parietal curvature index of the Arawe is significantly higher than the Sepik males ($P=.000$), thus supporting Larnach's general conclusions, there is a considerable overlap in the ranges for the index. The parietal curvature index remains an excellent indicator of artificial deformation but it cannot be used as the sole discriminator.

Goldstein (1940) noted that, apparently as a result of concurrent frontal and occipital flattening, a saddle-like depression often occurred in the anterior third of the parietal bones, beginning just behind bregma. Parietal saddles were present in eight of the 16 Arawe male crania, with the maximum depth of the depression reaching 4mm. Parietal saddles were not present in any of the undeformed crania examined.

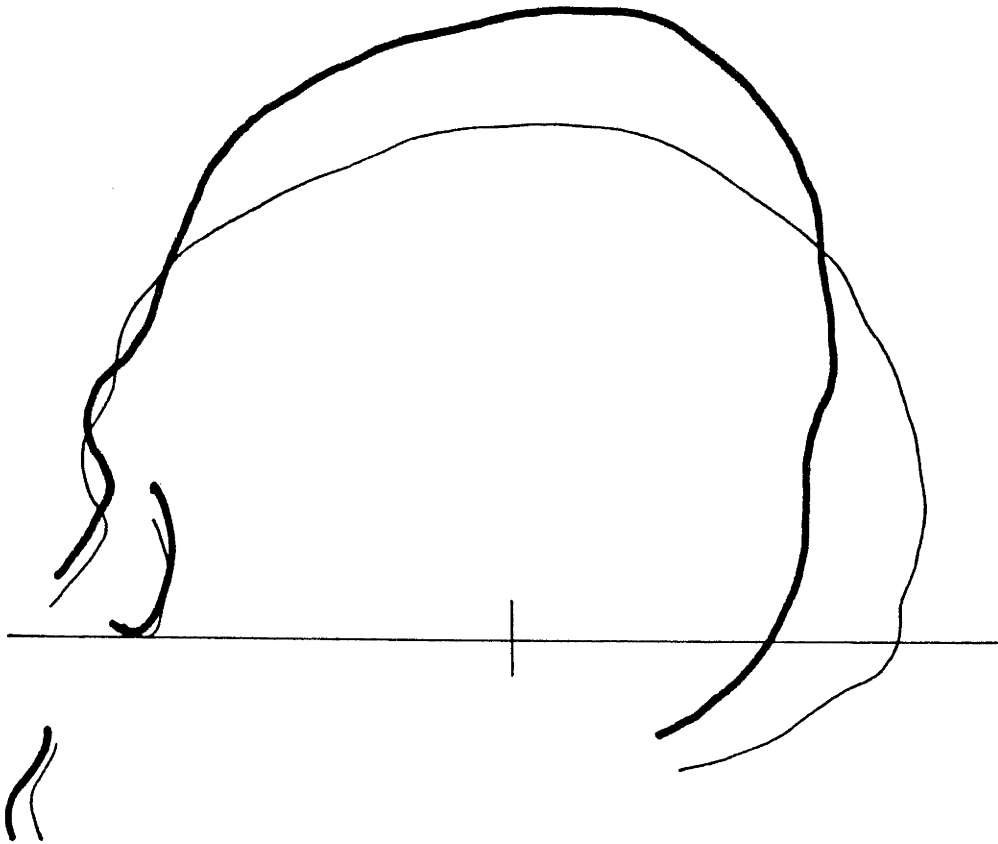


Figure 16. Midline cranial contour of male Arawe (heavy line) and an undeformed Tolai male from northern New Britain.

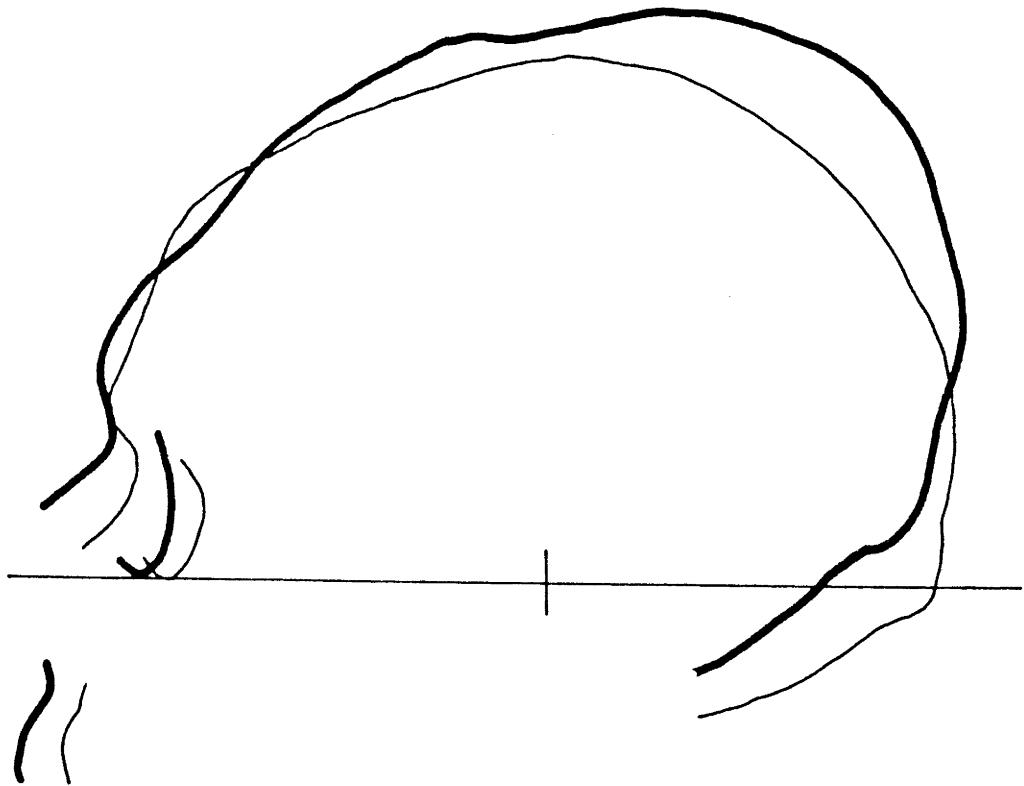


Figure 17. Midline cranial contour of male Arawe (heavy line) and an undeformed Tolai male from northern New Britain.

Pressure on the sides of the vault during head binding results in a lateral constriction of the Arawe parietals, with a reduction of maximum bi-parietal breadth. In some crania the parietals narrow to a marked point at the vertex, with the increase in curvature evident in both *norma lateralis* and in *norma occipitalis*.

As with the frontal and parietals, changes in occipital morphology resulting from head binding are most evident in lateral aspect. The Arawe occipitals are significantly longer (lambda-opisthion) ($P=.000$) and flatter than those in the undeformed series, with little evidence of an occipital bun. The deformed occipitals give the impression of being pushed up and under the parietals and present a flatter posterior surface to the vault than in undeformed crania (Figures 16 and 17; Appendix 2, Figures 1, 2 and 3).

An occipital curvature index was constructed using the chord length (lambda-opisthion) and the occipital subtense (maximum perpendicular distance from the occipital chord to the maximum projection of occipital curvature) measured by coordinate calipers. The occipital curvature index of the Arawe is significantly lower ($P=.000$) than in the undeformed crania, with only a slight overlap in range. With deformation the posterior edge of the foramen magnum is drawn upwards toward lambda. The upward movement of opisthion results in a reduction of the angle linking nasion-basion-opisthion. The mean foramen magnum-nasion angle is significantly lower in the Arawe than in the Sepik crania (Table 59).

One of the major distinguishing features of artificially deformed crania is a marked increase in cranial height (Kiszely, 1978). Pressure on the front and back of the cranium forces the posterior third of the frontal and much of the parietals upwards. This results in the elevation of bregma and vertex (Figures 16 and 17). Arawe cranial height (basion-bregma) is significantly greater ($P=.002$) than that in the undeformed series.

Maximum cranial length (glabella-opisthocranion) is not significantly greater in the Arawe, but there is a considerable difference in the mean location of opisthocranion. Opisthocranion, the most posterior point on the cranium in the midline, based on the Frankfurt Plane, is usually located posterior to lambda in Melanesian and Australian Aboriginal crania, especially those with a well developed occipital bun. In the Arawe the flattening of the occipital bone, coupled with the upward and backward movement of the parietals, results in opisthocranion being placed at lambda or up to 20mm in front of it on the parietals.

Changes in facial morphology with head binding appear to be highly variable. Although there is no significant difference between the mean gnathic indices of the two Melanesian series ($P=.213$), the maximum gnathic index of the Arawe (116) exceeds both that recorded for the Sepik (107) and the maximum recorded for Australian Aboriginal crania (112). There are no significant changes of facial breadth (maximum anterior frontal or bi-ectoconchion) with deformation, but there is a significant increase in upper facial height (nasion-nasospinale) and orbital height. The upper margins of the orbits were noticeably displaced posteriorly in eight of the Arawe male crania.

Blackwood and Danby (1955) sagittally sectioned four Arawe crania and noted a medial thickening of the frontal bone immediately anterior to

bregma. This was due to a thickening of the diploe, accompanied by a bulging of the outer table of the vault, the inner table remaining undisturbed. It is this expansion of the diploe which, in its maximum form, corresponds to the pre-bregmatic eminence. Lateral radiographs of the Arawe crania showed the variable development of this feature. An expansion of the diploe anterior to bregma is often accompanied by a marked constriction of the diploe midway between nasion and bregma. All of the Arawe crania radiographed displayed at least a slight expansion of the diploe in the posterior third of the frontal. I could not find this feature in lateral radiographs of undeformed Australian Aboriginal, Melanesian and European crania.

2. Coobool Creek, Kow Swamp-Cohuna and Murray Valley

The statistical data for the Coobool Creek and Murray Valley male crania are presented in Table 50, with the individual dimensions of the Kow Swamp 5, Cohuna, Coobool Creek 65 and Coobool Creek 49 in Table 60.

Compared to the Murray Valley series, the Coobool Creek crania are characterised by significantly larger mean cranial dimensions and greater morphological variation. The most striking feature of the Coobool Creek series is the marked frontal recession evident in several of the male and female crania, which in some cases is associated with a cranial height exceeding the modern Murray Valley range.

Compared to the Murray Valley frontals, the Coobool Creek frontals are greatly elongated and flattened. Both the mean frontal chord and frontal arc length of the Coobool Creek crania are significantly longer than in the Murray Valley males ($P=.000$; $P=.001$), with the frontal chord

Table 60. Comparative cranial dimensions for Coobool Creek 49 and 65, Kow Swamp 5 and Cohuna (mm.)

	CC 65	CC 49	KS 5	Cohuna	\bar{x}
Max. Bi-Parietal breadth	136	142	139	130	136.8
Glabella Opisthocranion	195	203	192	199	197.3
Glabella-Lambda	194	201	190	196	195.3
Basion Bregma	149	151	(148)	(141)	147.3
Basion-Nasion	102	100	---	(104)	102.0
Basion-Nasospinale	101	99	---	(102)	100.7
Basion-Prosthion	105	108	---	(112)	108.3
Basion-Lambda	129	142	---	(127)	132.7
Basion-Inion	85	78	---	---	81.5
Bi-Auricular breadth	127	130	118	128	125.8
Bi-Asterionic breadth	106	114	112	107	109.8
Fronto-Sphenoid breadth	112	112	95	96	103.8
Nasion-Bregma	129	127	(117)	125	124.5
Metopion height	16	21	15	18	17.5
Nasion-Metopion	47	61	45	73	56.3
Max. anterior Frontal breadth	112	120	111	115	114.5
Post Orbital constriction	88	106	96	89	94.8
Bi-Zygion	(143)	143	(139)	(145)	142.5
Bi-Zygomaxillary	103	109	103	110	106.3
Bi-Stephanion	87	113	109	93	100.5
Bi-Stenionic	73	73	64	69	69.8
Opisthion-Inion	47	43	(39)	--	43.0
Opisthion-Lambda	102	120	(108)	--	110.0
Opisthion-Asterion	68	71	(65)	--	68.0
Opisthion-Glabella	149	142	(143)	--	144.7
Foramen Magnum length	42	37	--	--	39.5
Foramen Magnum breadth	36	28	--	--	32.0
Basion-Sphenobasion	24	26	--	--	25.0
Basion-Asterion	84	87	--	(81)	84.0
Basion-Mastoidale	57	55	--	--	56.0
Basion-Staphylion	--	--	--	--	----
Lambda-Bregma	121	125	(125)	116	121.8
Lambda-Inion	60	91	76	--	75.7
Lambda-Asterion	86	100	93	88	91.8
Nasion-Nasospinale	57	55	53	54	54.8
Nasion-Prosthion	74	75	73	75	74.3
Nasal breadth	30	29	31	30	30.0
Orbital height	33	30	32	30	31.3
Orbital breadth	42	44	42	44	43.0
Frontal arc	141	139	(124)	140	136.0
Parietal arc	140	138	(144)	131	138.3
Occipital arc	111	142	(121)	----	124.7
Parietal subtense height	28	25	(29)	26	27.0
Bregma-Subtense	72	62	(57)	55	61.5
Frontal Curvature Index	12	17	13	14	14.0
Parietal Curvature Index	23	20	23	22	22.0
Occipital Curvature Index	20	26	(20)	--	22.0
Gnathic Index	103	108	---	108	106.3
Foramen Magnum-Nasion Angle	142	153	---	---	147.5

length of seven of the Coobool Creek males exceeding the Murray Valley range. The Kow Swamp and Cohuna crania are also characterised by a frontal chord length which is significantly greater than the modern range (Thorne, 1975).

Frontal curvature indices below the Murray Valley male series range (range 19-26) are found in six of the Coobool Creek male crania (range 12.4-18.2). In the most extreme of these (CC65) the frontal is flat to slightly concave anteriorly with no evidence of a frontal boss (Plate 13). In this individual metopion is located more posteriorly than in any of the Murray Valley males (Tables 50 and 60). The frontals of KS5, KS7 and Cohuna display similar flattening in their middle thirds, with a posterior location of metopion in KS7 and Cohuna. Variance both in the height and location of metopion is significantly greater in the Coobool Creek crania than in the Murray Valley series ($P=.004$; $P=.013$).

A well developed pre-bregmatic eminence is present in the Coobool Creek male CC65, with a moderate development of this feature evident in CC29, KS7 and Cohuna. Pre-bregmatic eminences were not present in any of the Murray Valley crania examined and are not present in the crania from Roonka, Swanport and Broadbeach that I examined. Lateral depressions bordering the midline are well developed in the Coobool Creek female CC01 (Plate 1) and KS5, with a slight development in CC 41.

Viewed laterally, the Coobool Creek parietals vary in curvature with greater variance and a higher mean curvature index than the Murray Valley males. The parietal curvature index of Coobool Creek males CC65 and CC41, Coobool Creek female CC01 (index 24.6), Kow Swamp 5 and Cohuna are at the top of the Murray Valley range and within the lower limit for the Arawe

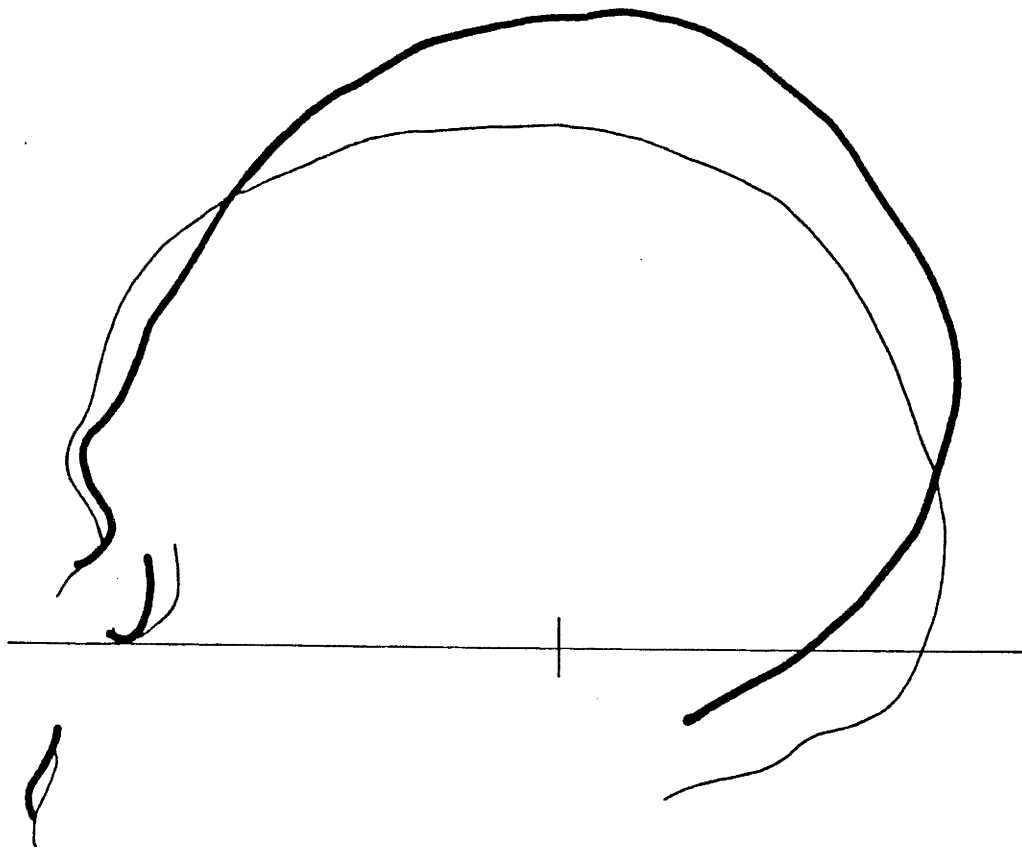


Figure 18. Midline cranial contour of Kow Swamp 5 (heavy line) and a recent male cranium from the Murray Valley.

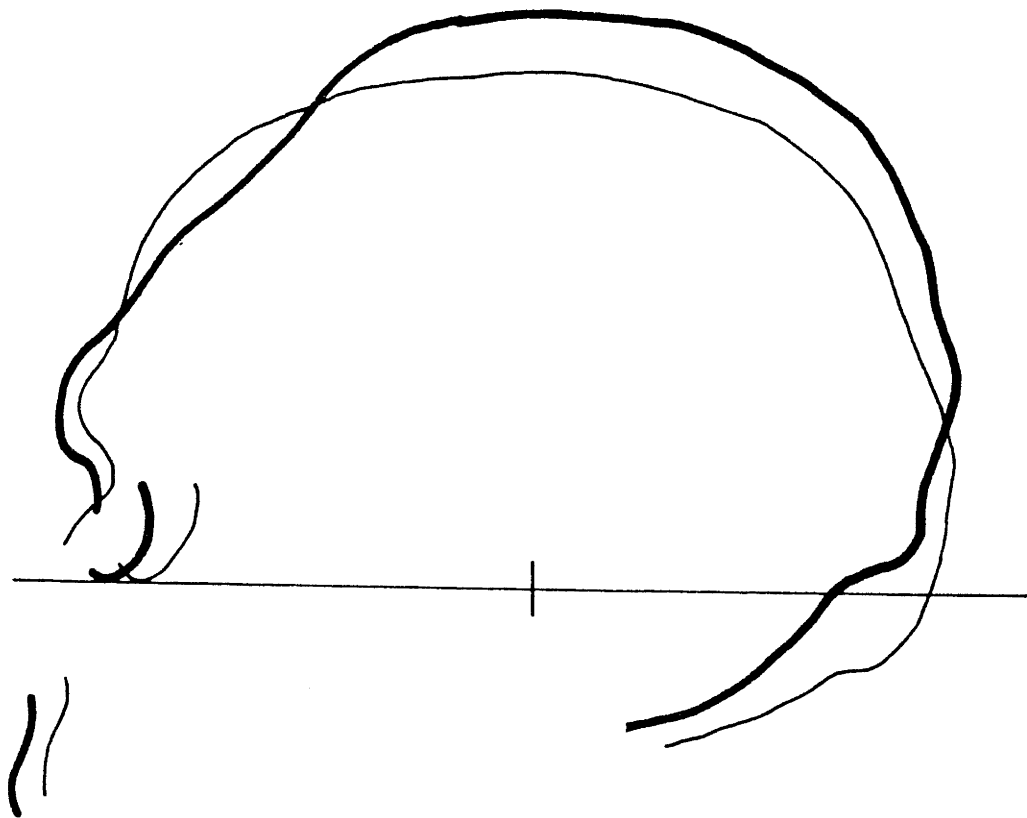


Figure 19. Midline cranial contour of Coobool Creek 65 (heavy line) and a recent male cranium from the Murray Valley.

(Tables 50, 59 and 60). Parietal curvature in the Coobool Creek crania does not approach the extremes of the Arawe, with no evidence of either a marked pointing of the parietals towards vertex or lateral constriction. However, the curvature is certainly more marked than is common in Australian Aboriginal crania (Figures 18 and 19). Both mean bi-parietal and bi-auricular breadth in the Coobool Creek crania are significantly greater than in the Murray Valley male series ($P=.000$; $P=.000$). There is no evidence of the lateral constriction of the vault as evident in the Arawe. Parietal saddles are not present in the Kow Swamp, Coobool Creek or Murray Valley crania examined. However, a marked parietal saddle, in association with a low frontal curvature index and a high parietal curvature index, is present in the 'Nancurrie cranium'. This heavily mineralised cranium was presented to the Australian Institute of Anatomy (A.I.A. registration number 3363) by G.C. O'Donnell from a site near Coobool.

Variation in the Coobool Creek occipitals is similar to that in their frontal and parietal bones. The mean length of the Coobool Creek occipitals is significantly higher than that for the Murray Valley series ($P=.000$), with greater variance ($P=.004$). There is a tendency for the occipital curvature index of the Coobool Creek crania to be lower, with the indices of crania CC18, CC41, CC65 and KS5 being below the Murray Valley series range. In Coobool Creek crania CC01, CC49, CC65 and Kow Swamp 5 the occipitals give the impression of being pushed up and under the parietals, presenting a flatter posterior surface to the vault than is common in Murray Valley crania (Figures 18 and 19). Poor preservation of the occipital in the Kow Swamp-Cohuna material prevents the measurement of the occipital curvature index in all crania except KS5. Enough of the occipital is preserved in KS1 to demonstrate a high degree of curvature for this specimen, well within the modern range.

Although there is no significant difference between the mean nasion-foramen magnum angle of the Coobool Creek and Murray Valley crania, the angle in Coobool cranium CC65 is well below the Murray Valley range. In this individual the posterior third of the foramen has been drawn up toward lambda, presenting a similar appearance to that seen in some of the Arawe crania. Once again poor preservation prevents the measurement of this angle in the Kow Swamp and Cohuna crania.

One of the major distinguishing features of the Coobool Creek series is a high mean cranial height. The mean basi-bregmatic height of the Coobool Creek male crania is significantly higher than in the Murray Valley male series, with the Murray Valley maximum of 143mm being exceeded by six of the Coobool Creek male crania. The maximum basion-bregma height in the Coobool Creek series (153mm) exceeds the maximum recorded for Australian Aboriginal crania (150mm for Broadbeach male 102, author's observation). In Australian Aboriginal crania there is normally a strong positive correlation between basion-nasion length and basion-bregma height. In the pooled Murray Valley male and female sample a strong correlation of $r=.676$ ($n=95$) was obtained, with a lower correlation in females ($n=49$, $r=.335$) than in males ($n=46$, $r=.585$). In the Coobool Creek crania the correlation for the pooled male and female sample is only slight ($n=23$, $r=.370$), with an extremely low correlation of $r=.080$ ($n=17$) in the male crania (there are too few females in the Coobool Creek female sample to provide statistically significant results). The great basi-bregmatic height of Coobool Creek crania CC49, CC65, Kow Swamp 5 and Cohuna, coupled with a low frontal curvature index, relatively high parietal curvature index and a low occipital curvature index, gives these crania a midline cranial contour similar to the Arawe mean (Figures 16-19).

The mean cranial length (glabella-opisthocranion) figure for the Coobool Creek male crania is significantly higher than in the Murray Valley series ($P=.000$). Opisthocranion is located well below lambda in the Coobool Creek crania with well developed occipitals. In those crania with high parietal curvature indices and flat occipitals (CC49, CC65, female CC01) opisthocranion is located at lambda. In Kow Swamp 5 opisthocranion is located just below lambda.

Lateral radiographs taken of the Coobool Creek crania display a marked thickening of the diploe anterior to bregma in the frontals of CC01, CC29, CC49 and CC65. In CC65 it is this expansion of the diploe which results in the well developed pre-bregmatic eminence, with a maximum vault thickness of 12.1mm at this point. In CC65 and CC01 this posterior thickening of the frontal diploe is preceded by a constriction of the diploe in the middle third of the frontal. Although radiographs of the Kow Swamp and Cohuna crania are not available, it is evident that there is a pre-bregmatic expansion of the diploe in KS5, KS7 and Cohuna. This feature was not present in lateral radiographs of Australian Aborigines from Yuendumu that I examined.

The distribution of the variables in the Murray Valley and Coobool Creek male samples was compared with the normal curve using the W statistic. Six cranial variables in the Murray Valley sample and 14 in the Coobool Creek series obtained significant values for W ($P=.01-.00$). Two variables, opisthion-lambda and basion-asterion, displayed non-normal distributions in both samples.

Variables with distributional abnormalities in the Coobool Creek sample were concentrated on the occipital (basion-inion, bi-asterion,

opisthion-lambda, foramen magnum length, basion-asterion and lambda-inion) and frontal bones (glabella-bregma, nasion-bregma and nasion-metopion). Three variables are measures of cranial breadth (bi-auriculare, bi-asterion and bi-sphenion) and one of cranial height (auriculare-bregma).

An examination of the plots associated with the Shapiro-Wilk statistic and the raw data indicated the departure from normality generally was in the form of a clearly bimodal distribution or an extended distribution without any modes at all. One variable, basion-inion, is markedly leptokurtic with a sharp peak at the mean and extended tails. Foramen magnum length has a strong right skew.

The Murray Valley variables with significant values for W are also concentrated on the occipital (opisthion-lambda, opisthion-asterion and basion-asterion). These three variables have symmetrical platykurtic distributions with a flat top and abrupt terminals. A similar distribution is present for both bi-stenion and orbital height. The remaining non-normal variable, auriculare-nasion, has a distribution which is skewed to the left.

Discriminant analysis

1. Sepik River and Arawe

The main aim of the discriminant analysis was data reduction, to isolate those variables which best discriminate between the deformed Arawe crania and the undeformed crania from the Sepik River. The stepwise procedure of the discriminant analysis sought to maximise the Mahalanobis distance between the two groups. A variable was considered for selection only if its partial multivariate F ratio was larger than a specified value.

The partial F ratio measures the discrimination introduced by the variable after taking into account the discrimination achieved by the other selected variables. If the partial F is too small, the variable is rejected. This stepwise procedure results in the optimal set of discriminating variables (Nie, *et al.*, 1975:448).

For the initial discriminant run 18 variables were selected. These variables covered three general anatomical regions: the face, the cranial base and the vault. Although the majority of these variables had significant differences in mean values between the two samples, this was not the only selection factor. I was also interested in those variables which would not discriminate between the two groups.

The variable list comprises: maximum bi-parietal breadth, glabella-opisthocranion, basion-bregma, basion-nasion, basion-nasospinale, basion-lambda, bi-sphenion, nasion-bregma, metopion height, nasion-metopion, supraorbital breadth, bi-zygion, bi-zygomaxillary, opisthion-lambda, lambda-bregma, nasion-nasospinale, nasal breadth, orbital height and parietal subtense height.

The stepwise procedure reduced the initial 18 variables to 9 in the final function. To reduce the size of the covariance matrix the analysis was run again with the selected variables (maximum bi-parietal breadth, basion-bregma, bi-sphenion, nasion-bregma, metopion height, opisthion-lambda, nasion-nasospinale, nasal breadth and parietal subtense height).

Equality of the group covariance matrices was tested using Box's M and its associated F ratio (Box 1949). The F statistic was not significant at the 0.05 level, so it can be assumed the covariance matrices are equal (Table 61).

TABLE 61: Test of equality of group covariance matrices using Box's M

	Box's M	F	Degrees of freedom		P
AR-SR	0.7195	0.9609	45,	2026.8	0.5465
CC-MV	0.9755	2.0320	36,	2100.7	0.0003
AR-SR-CC-MV	0.2666	1.4250	135,	5599.1	0.0010

AR=Arawe SR=Sepik River MV=Murray Valley CC=Coobool Creek

Table 62 lists the standardised coefficients for the nine discriminating variables. These indicate that metopion height was the best single discriminator, followed by parietal subtense height and nasion-bregma. The remaining six variables were less important. This is in agreement with the univariate results, which demonstrate that parietal curvature and the length of the frontal bone are good discriminators between deformed and undeformed crania. The final function correctly classified 100 percent of both groups, with a wide separation of the group centroids (Figure 20).

TABLE 62: Standardised canonical discriminant function coefficients

	SR-AR	CC-MV
Bi-parietal breadth	-0.8397	-0.5013
Nasion-bregma	-0.4896	-0.3612
Bi-sphenion	0.6283	0.3571
Nasion-bregma	1.1671	-0.2377
Metopion height	-1.4912	0.4226
Opisthion-lambda	0.9833	-0.3454
Nasion-nasospinale	-0.3428	-0.3227
Nasal breadth	0.6165	-0.2868
Parietal subtense height	1.4134	-

SR=Sepik River AR=Arawe MV=Murray Valley CC=Coobool Creek

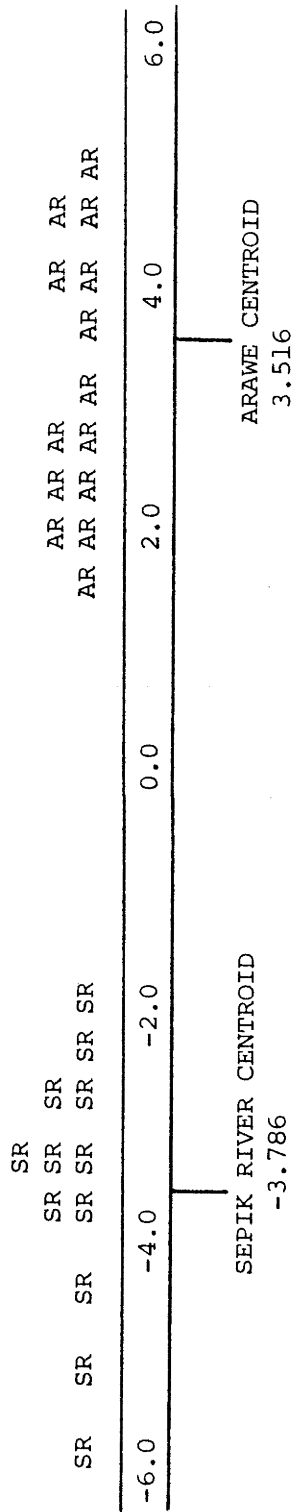


Figure 20. Canonical discriminant function 1 : Sepik River males (n=12) and Arawe males (n=14)

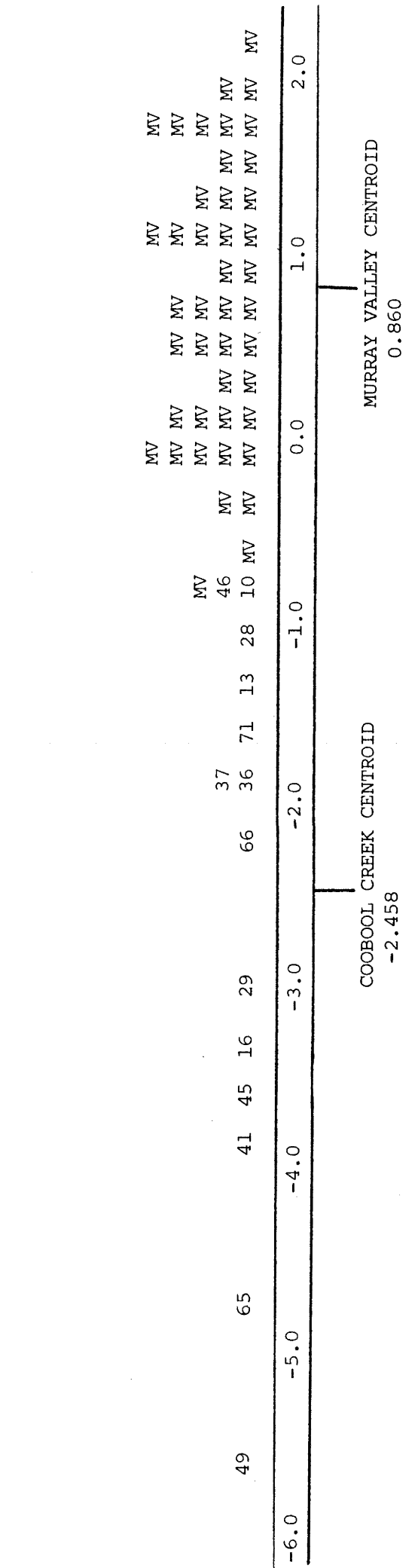


Figure 21. Canonical discriminant function 1 : Coobool Creek males (n=14) and Murray Valley males (n=43)

TABLE 63: Eigenvalues, Wilks lambda and canonical correlations for the three discriminant analyses

	Eigen- value	% variance	canonical corre- lation	Wilk's lambda	Chi- squared	D.f.	P
SR-AR	28.356	100	0.982	0.0340	55.796	9	0.0000
CC-MV	2.197	100	0.829	0.3127	72.660	8	0.0000
SR-AR-CC-MV							
Function 1	4.912	78	0.911	0.0602	209.240	27	0.0000
Function 2	1.034	16	0.713	0.3564	76.843	16	0.0000
Function 3	0.378	6	0.523	0.7254	23.913	7	0.0012

2. Coobool Creek and Murray Valley

The nine variables selected in the preceding analysis were then used in a discriminant analysis of the Coobool Creek and Murray Valley data; the Kow Swamp and Cohuna crania each had one or more missing variables and so were excluded from the analysis. The stepwise procedure reduced the initial nine variables to eight, with parietal subtense height not contributing to the discriminatory power of the function (Table 62). The exclusion of parietal subtense height is of importance, as this was the major discriminator between the Arawe and Sepik River crania. An examination of the parietal curvature indices for the Coobool Creek crania indicated that only two of the crania included in the discriminant analysis (CC41 and CC65) had relatively high parietal curvature indices. There is no significant difference in mean parietal subtense height between the remaining Coobool Creek and Murray Valley crania.

A comparison of the group covariance matrices using Box's M indicated a significant F level ($P=.0003$) and the covariance matrices are therefore unequal (Table 61). This results from the greater variance in the Coobool

Creek sample for the selected variables. These results differ from the homogeneity of covariance demonstrated in the Arawe-Sepik River comparison. The major factor contributing to the inequality of the Coobool Creek and Murray Valley covariance matrices is that the Coobool Creek sample contains both deformed and undeformed crania. This has resulted in skewed distributions for the variables influenced by deformation and great variance. In contrast to the Coobool Creek situation, all of the Arawe sample are deformed and there is less morphological variation. Few of the variables in the Arawe sample have significant values for the W statistic.

The standardised coefficients computed for the discriminating variables (Table 62) indicate that maximum bi-parietal breadth is the most important discriminator, followed by metopion height, with the remaining variables contributing fairly equally. A plot of the canonical discriminant function scores (Figure 21) demonstrates the greater variance in the Coobool Creek sample, as defined by the discriminating variables, compared to the Murray Valley series. The two Coobool Creek crania clearly differentiated by this analysis (at the greatest distance from the Murray Valley group centroid) are CC49 and CC65. All of the Coobool crania and 95.2 percent of the Murray Valley crania are correctly classified by this function. The dimensions which distinguish the Arawe from the Sepik River crania also clearly distinguish the Coobool Creek crania from the Murray Valley series.

A comparison of the final eigenvalues and Wilks Lambda for the two analyses indicates the greater capacity of the selected variables to discriminate in the Arawe-Sepik River comparison than in the Coobool Creek-Murray Valley comparison (Table 63). There is a much lower eigenvalue connected with the latter analysis and a higher Wilks Lambda. This results from the overlap in the ranges defined by the variables in the Coobool Creek-Murray Valley comparison.

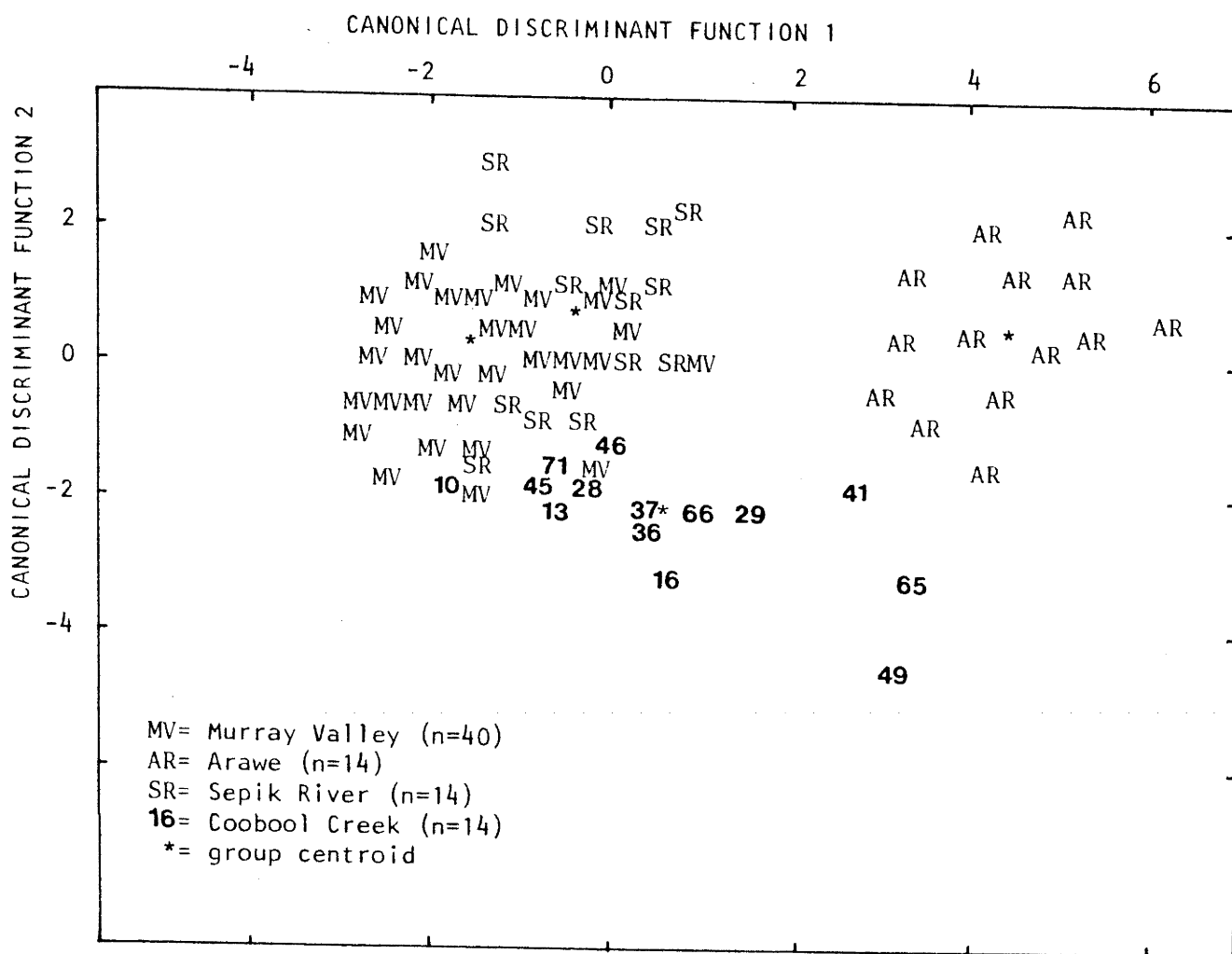


Figure 22. Canonical discriminant analysis of Australian Aboriginal male crania from the Murray Valley and Coobool Creek and Melanesian male crania from the Sepik River and New Britain (the Arawe), all groups scatterplot.

3. Murray Valley, Coobool Creek, Arawe and Sepik River

A four-way comparison was undertaken using the same nine variables, all of which were retained by the stepwise procedure. The higher variance in the Coobool Creek and Arawe groups, relative to that in the Sepik River and Murray Valley, resulted in inequalities in the covariance matrices and a significant F value for Box's M (Table 61).

Three functions were developed, the initial function accounting for 77.6 percent of the variance, with a higher eigenvalue and lower Wilks Lambda, and the other two functions being of less importance (Table 63).

Of greatest interest here was a plot of the canonical discriminant function scores and the location of group centroids (Figure 22). The Murray Valley and Sepik River crania cluster together, with little distance between their respective centroids. The Arawe and to a lesser extent the Coobool Creek crania can be clearly distinguished from these two groups. An examination of the probabilities of group misclassification indicated that three of the Coobool Creek crania (CC65, CC49 and CC41) were most likely to be classified with the Arawe after their own group.

Discussion

Taking this analysis as a whole it is evident that several of the crania from Coobool Creek and Kow Swamp, plus the Cohuna cranium, are artificially deformed. The crania which show obvious signs of deformation are Coobool Creek crania CC01, CC41, CC49 and CC65, Kow Swamp crania KS5 and KS7 and Cohuna. Both the Arawe and Coobool groups could be clearly distinguished in the discriminant analysis from the other two groups. Three of the Coobool crania (CC41, CC49 and CC65) were found to cluster closer to the Arawe

centroid than the Murray Valley centroid. The features which differentiate these crania and the Arawe from undeformed crania are:

1. A long and flat frontal bone. Flattening of the frontal is evident in the middle third with a posterior location of metopion. A pronounced thickening of the diploe occurs anterior to bregma, with a thinning of the diploe in the middle third of the frontal. Symmetrical depressions border the midline in the anterior two-thirds of the bone.

2. Great basion-bregma height.

3. A long and flat occipital, with a low occipital curvature index and minimal development of the occipital bun. In Coobool cranium CC65 the posterior edge of the foramen magnum is oriented towards lambda, resulting in a low nasion-foramen magnum angle.

4. A high parietal curvature index.

5. Greater variability in the parietal curvature index, the frontal curvature index and the location of opisthocranion.

The major features which distinguish the Arawe from crania such as Kow Swamp 5 and Coobool 65 relate to the greater degree of deformation evident in the Arawe, especially in the parietals, and the well developed cranial breadth in the Australian crania. In the Arawe head binding restricts the lateral development of the parietals, forcing them inward and upward. In direct contrast to this, the Australian crania CC01, CC49, CC65, KS5 and Cohuna all have broad vaults, with a mean bi-parietal breadth which is significantly greater than the Australian mean. This suggests that the Australian crania could not have been deformed by a fixed series of head bindings such as those employed by the Arawe.

I can find only three ethnographic references to intentional cranial deformation among Australian Aborigines. In 1841 G.A. Robinson (Kenyon, 1928:165) recorded that a few of the children of the Burrumbeet of northern Victoria had their heads artificially flattened. Robinson does not describe the method by which the crania were deformed and makes no other reference to the practice. It should be noted that in over 1000 recent Australian Aboriginal crania from Victoria and the Murray River Valley which I have examined there was no evidence of artificial deformation.

Brierly (1848-1850) and Macgillivray (1852) both present detailed descriptions of infant head pressing in Cape York. 'Pressure is made by the mother with her hands...one being applied to the forehead and the other to the occiput, both of which are thereby flattened, while the skull is rendered proportionally broader and longer than it would naturally have been' (Macgillivray, 1852:12). Further north, in the islands of Torres Strait, head pressing was recorded by Miklouho-Maclay (1882) and Haddon (1912:7-9). In his report Haddon describes the head-pressed crania at Mabuiag as being 'low in the forehead, flat at the back and not too well developed above'.

Head pressing would produce a more subtle and variable deformation of the vault than head binding and this is probably the method employed on the deformed Coobool and Kow Swamp crania. At Coobool and Kow Swamp there is a fine gradation from the crania that are obviously deformed into those which show no evidence of deformation. This creates problems of definition. Three crania at Coobool (CC35, CC41 and CC66) and one at Kow Swamp (KS1) have long flat frontal bones without possessing great basi-bregmatic height. The frontal curvature indices for each of these crania (range 14.3-15.8) are well below the modern Murray Valley range (19-26) and the length of the frontals

(nasion-bregma range 119-128mm) is either at the top of, or exceeds, the modern range (102-120mm). Basi-bregmatic height (range 139-142mm), while towards the top of the modern range (126-143mm), is not great given the overall size of the crania. Parietal curvature indices in the three Coobool crania (range 22-23) is at the top of the modern range (17-23), while that in KSl is only moderate (19). The occipital in KSl is well developed, with a good occipital bun and torus, while the Coobool occipitals are close to the modern mean in length (opisthion-lambda range 96-105mm) and curvature index (range 25-30).

Whether or not these four crania are classified as artificially deformed ultimately depends on subjective factors of weighting. It is conceivable that crania of this morphology could be produced by head pressing, with gross deformation evident only in the frontals, but a survey of the literature on artificial cranial deformation has not revealed any similar crania. The difficulty is increased through the lack of adequate reference material. The artificially deformed crania in Australian collections were collected primarily for their novelty value, with the grossly deformed crania possibly being over represented. A more complete study would look at the within-population gradation from the deformed to the undeformed range. Ethnographic accounts of artificial deformation all stress the great within-population variability in deformed crania (Dingwall, 1931).

The isolation of those variables unaffected by deformation is a necessary prerequisite to morphological analysis of comparative biological relationships. Although this area has received some attention in respect to artificially deformed American Indian crania (Shapiro, 1928; Oetteking, 1930; McNeal and Newton, 1965; Hughes, 1968; Cybulski, 1975), similar analyses are not available for populations with differing modes of deformation.

Table 64

Comparative dimensions of the oro-facial skeleton in the deformed (Group A) and apparently undeformed (Group B) Coobool Creek male crania

	Group	n	\bar{X}	s	t	P
Basion-nasion	A	5	103.2	2.28	1.86	0.050
	B	7	106.7	3.35		
Basion-nasospinale	A	5	100.6	2.31	1.30	0.200
	B	7	103.5	4.54		
Basion-prosthion	A	5	107.0	1.58	2.63	0.050
	B	6	112.6	4.13		
Supraorbital breadth	A	5	114.2	4.15	0.82	0.500
	B	6	116.3	3.61		
Bi-zygomaxillare	A	5	103.2	3.63	0.91	0.500
	B	5	100.0	6.04		
Nasion-nasospinale	A	5	54.0	2.92	0.27	0.800
	B	7	54.5	3.64		
Nasospinale-prosthion	A	5	20.2	2.49	0.22	0.800
	B	6	20.6	3.72		
Nasal breadth	A	5	28.6	1.14	1.35	0.200
	B	7	29.5	1.13		
Orbital height	A	5	31.4	1.14	0.45	0.600
	B	7	32.0	2.58		
Orbital breadth	A	5	43.4	1.34	1.18	0.250
	B	6	45.0	2.45		
Alveolar length	A	5	62.6	2.07	2.79	0.020
	B	6	66.5	2.07		
Alveolar breadth	A	5	71.4	2.07	1.05	0.200
	B	6	74.3	5.28		
Gnathic Index	A	5	103.7	2.95	0.62	0.500
	B	6	105.1	4.07		

Due largely to intra-population variations in deformation, analyses of the anatomical regions unaffected by deformation have produced conflicting results. McNeal and Newton (1965) document extensive alteration in cranial base morphology with deformation, while Hughes (1968) found that basal and facial measurements remain unaffected. Brothwell (1965:72) indicates that upper facial height is the only measurement unlikely to be influenced by deformation. With extreme deformation, Cybulski (1975:65) argues that the effects extend throughout the entire cranium.

With the Coobool Creek and Kow Swamp crania the isolation of those anatomical regions least influenced by deformation is complicated by temporal factors, most notably the large size of the crania. Although the samples are small, some control on this can be gained through a comparison of the Coobool Creek male crania that show evidence of deformation (CC29, CC41, CC49, CC65 and CC66) with those that do not (CC10, CC13, CC28, CC37, CC45, CC46 and CC71).

The area of the Coobool Creek male crania which appears to be least affected by deformation is the oro-facial skeleton. The same morphological pattern of low, horizontal orbits, robust and deep malars, marked subnasal prognathism and broad, high palates is common to both deformed and undeformed crania. Comparisons of facial length, breadth and prognathism data for these two groups demonstrate the similarity of the samples (Table 64). Only three variables (basion-nasion, basion-prosthion and alveolar length) exhibit a significant difference between the mean values ($P=.05-.02$). For each of these dimensions the undeformed crania have the higher mean value. The mean gnathic index of the deformed crania (103.7) is lower than the mean of the undeformed group (105.1), but I do not believe that this is a function of deformation. The maximum gnathic index of the two samples is

similar (deformed maximum 108 and undeformed maximum 108.5) and the difference between the two groups may simply be a function of sampling.

Cybulski's (1975:134) analysis of prognathism among four North West Coast American Indian groups, three of which practised deformation, indicated that the gnathic indices were actually slightly higher in the three deformed groups.

4.3 Variance in the Coobool Creek cranial dimensions

Comparisons of sample variance between the Coobool Creek and comparative samples produced 27 significant F values ($P=.05-.000$). Of these all but seven resulted from greater variance in the Coobool Creek sample (Tables 46-58).

Coobool Creek and Murray Valley males

There are 12 significant F values ($P=.053-.000$) in this comparison. Three of these variables (basion-mastoidale, auriculare-nasospinale and auriculare-prosthion) display greater variance in the Murray Valley sample.

Predictably the variables with high levels of variance in the Coobool Creek crania are concentrated in the areas of the vault which have been influenced by deformation. Two variables relate to frontal bone curvature (metopion height and nasion-metopion) and one to parietal bone curvature (parietal subtense height). The remaining variables indicate variance in posterior cranial morphology, especially in the size of the occipital bone (basion-lambda, opisthion-lambda, lambda-inion, auriculare-lambda, auriculare-asterion and the occipital arc).

Coobool Creek and Murray Valley females

Five F values are significant ($P=.058-.002$), with one of these (basion-inion) showing greater variance in the Murray Valley sample. The Coobool Creek sample has great variance in frontal bone curvature (metopion height and nasion-metopion), in one basal breadth dimension (basion-asterion) and in opisthion-glabella length.

Coobool Creek and Swanport males

Six variables obtained significant values for F ($P=.048-.000$), with two variables (auriculare-opisthion and auriculare-basion) having greater variance in the Swanport sample. In support of the previous results, the Coobool Creek variables displaying great variance are concentrated on the frontal (nasion-bregma and metopion height) and occipital (opisthion-lambda and lambda-asterion).

Coobool Creek and Swanport females

Five variables (basion-nasion, metopion height, nasal breadth and alveolar length) obtained significant F values in this comparison. Rather than indicating especially great variance in the Coobool Creek sample, the significant F values for two of these variables (nasal breadth and alveolar length) result from extremely low levels of variation in the Swanport sample. Similar results are obtained when the Swanport data are compared to the Murray Valley female sample.

Coobool Creek and Broadbeach males

The variable list available for this comparison is reduced from 64 to 24 variables. Few of the variables which show high levels of variance in the Coobool Creek sample are included. The one unusual result of this

comparison is that there are no significant differences in the variances of frontal curvature and length between these samples. The only variable obtaining a significant value for F ($P=.011$) is upper facial height (nasion-prosthion), which has greater variance in the Broadbeach sample.

4.4 Temporal change in Murray Valley crania: correlation and discriminant analysis

Morphological and statistical comparisons have differentiated the Kow Swamp crania from modern Australian Aboriginal crania (Thorne, 1975; Pietrusewsky, 1979) and a more gracile group of Pleistocene Aboriginal crania including Mungo 1, Mungo 3 and Keilor (Thorne, 1977; Thorne and Wilson, 1977). Recently the first detailed argument for a regional clade containing the Indonesian *Homo erectus* crania and the Kow Swamp material has been presented (Thorne and Wolpoff, 1981).

In their multivariate statistical comparison of the Kow Swamp crania with a 'modern' Victorian series Thorne and Wilson (1977) found that the major distinguishing features were fronto-facial in origin. They argue this indicates that major morphological changes have occurred in the facial and frontal regions of Aboriginal crania from northern Victoria over the last 9,000-10,000 years. Pietrusewsky (1979) obtained similar results. The most aberrant sample in his entire analysis was Kow Swamp, which failed to cluster with any of the other prehistoric or modern samples.

The results of the analysis of cranial deformation indicate that in order to obtain biologically meaningful results, analysis of temporal change using the Coobool Creek and Kow Swamp crania should be restricted to those areas of the cranium unaffected by deformation. This has not been the procedure employed in the published multivariate comparisons of the Kow Swamp

series (Thorne and Wilson, 1977; Pietrusewsky, 1979). In these analyses variables which have been influenced by deformation, especially those relating to the length and curvature of the frontal bone, have been included. Therefore, their results contain both a cultural and biological component. The difficulty in these analyses is to differentiate one from the other.

For the multivariate analysis of temporal change in crania from the Murray River Valley variables were selected from those areas of the craniofacial skeleton which did not appear to be influenced by cranial deformation. The results of the analysis of cranial deformation, combined with the previous morphological and univariate analysis, indicates that there is only one area of the Coobool Creek crania that is not influenced by deformation, the facial skeleton. This was the principal factor determining variable selection for the discriminant analyses.

An alternative approach, which would have increased variable coverage, would have been to include only those crania which do not appear to be artificially deformed. There are major problems associated with this procedure however. Most importantly, due to the morphological gradation from the deformed to the undeformed range, there is some degree of subjectivity involved in allocating crania to either group. This is particularly difficult in the case of Kow Swamp where the crania are incomplete. In addition this procedure would severely restrict the size of the sample.

An initial series of 13 variables were examined. Three of these are measures of facial prognathism (basion-nasion, basion-nasospinale and basion-prosthion), four variables measure aspects of upper-facial breadth (maximum supraorbital breadth, bi-zygomaxillare, nasal breadth and orbital breadth), four of facial height (nasion-nasospinale, nasion-prosthion,

nasospinale-prosthion and orbital height) and the final two variables were alveolar breadth and length.

Each of these variables was compared with the normal distribution using the Shapiro-Wilk statistic (W), Tables 46-49. Five variables obtained significant values for W ($P=.01-.00$). These variables are orbital height (Murray Valley males and females), orbital breadth (Swanport males and Coobool Creek males) and basion-prosthion and alveolar breadth in the Broadbeach male sample.

A series of trial discriminant analyses was performed using a stepwise selection procedure which maximised the Mahalanobis distance between groups. The stepwise procedure, by selecting the optimal set of discriminating variables, indicated possible redundancies (for a discussion of the stepwise procedure and discriminant analysis in general see Section 2). Two variables, orbital breadth and nasion-prosthion, did not contribute significantly to the discrimination between groups, when combined with the other variables, and were excluded from the analysis. The inclusion of bi-zygomaxillare, although slightly increasing the distance of the Coobool Creek sample from the comparative samples, reduced the size of the Coobool Creek male sample from 12 to nine. In order to maximise the number of crania included in the analysis, this variable was excluded.

A final problem concerned sample size. For purposes of discriminant analysis the Broadbeach male, Broadbeach female and Coobool Creek samples are small. Although there are 14 crania in the Broadbeach male sample, most of these are fragmentary, with only six crania preserving the full set of facial variables. The small size of this sample resulted in a singularity in the Broadbeach covariance matrix. This prevented statistical comparison

of the group covariance matrices and the calculation of Box's M. Similar results were obtained in discriminant analyses containing the Broadbeach and Coobool Creek female crania. In order not to compromise the results of the final discriminant analysis, this analysis was restricted to the three male groups (Coobool Creek, Murray Valley and Swanport) with sufficiently large samples.

Correlation

The association of the variables considered for discriminant analysis was tested using Pearson's linear correlation coefficient (r). Correlation matrices were developed from the Murray Valley sample to examine possible sex-based variation in correlation, the effect of the distance between the male and female means on the size of the correlation, topographical and biological correlations between the variables and the allometric association between the size of the face and the size of the cranial vault.

Matrices were formed using the convention of listwise deletion of missing data, a procedure which excludes crania with missing data from the analysis. This reduced the size of the Murray Valley sample to 44 males and 47 females. Separate matrices were developed for the male, female and pooled samples. For samples of 44-47 a correlation of $r=.255-.245$ is significant at the .05 level, while for the pooled sample ($n=91$) a correlation of $r=.173$ is significant at the .05 level. Bivariate plots were produced for each pair of correlates and examined for distributional linearity and, in the pooled sample, the distance between the male and female clusters. Only correlations greater than $r=.39$ which have a reasonably linear distribution are considered important for purposes of this analysis (Tables 65-67).

Due to the relatively small size of the Coobool Creek sample the male and female crania are pooled. Exclusion of crania with missing variables reduced the size of the sample to 13 (10 males and 3 females). For a sample of 13 a correlation coefficient of $r=.477$ is significant at the .05 level (Table 68).

Facial size, prognathism and vault size

The possibility of an allometric association between facial size, facial prognathism and the overall size of the cranial vault was examined. The variables defining facial size and prognathism were correlated with the three variables which describe the general size of the vault—cranial breadth (maximum bi-parietal breadth), cranial length (glabella-opisthocranion) and cranial height (basion-bregma).

In each of the Murray Valley samples only low levels of correlation are present between bi-parietal breadth and the facial variables. The highest positive correlation ($r=.355$) is between bi-parietal breadth and upper facial height (nasion-nasospinale) in the pooled sample. There are five negative correlations associated with bi-parietal breadth in the Murray Valley male sample and three in the Murray Valley females. These data indicate that there is little association between the size of the facial skeleton and cranial breadth in the Murray Valley sample. Moderate to high correlations are present between bi-parietal breadth and two of the facial variables, basion-nasion ($r=.405$, $P=.084$) and supraorbital breadth ($r=.640$, $P=.009$) in the Coobool Creek sample.

Unlike cranial breadth, cranial length shows moderate correlation with upper facial height (nasion-nasospinale and nasion-prosthion) and supraorbital breadth in each of the Murray Valley samples. In the pooled sample cranial length obtains moderate to high levels of correlation ($r=.453-.749$) with all of the facial variables except orbital height ($r=.248$). Examination of the bivariate plots indicate that there is a general pattern of covariance for these data and a biological association between facial size and the length of the cranium. The Coobool Creek data support those obtained with the Murray Valley samples.

Similar results to those obtained with cranial length were achieved with cranial height (basion-bregma) in the Murray Valley male and pooled samples. However, there is no correlation between the facial variables and cranial height in the female sample greater than $r=.366$. Basion-bregmatic height shares a common reference point with the three measures of prognathism (basion-nasion, basion-nasospinale and basion-prosthion). Solow (1966:75) found that when two or more variables share a common reference point, the variation of this point will be common to each of the variables. Such variables will be correlated even when the remaining reference points vary independently. Therefore a moderate level of correlation between these four variables is to be expected and does not necessarily imply a biological relationship. Bi-variate plots of these data indicate that the increased level of correlation in the pooled sample is a function of the distance between the male and female means, rather than an overall pattern of covariance.

Given the expected association between the four variables sharing basion as a common reference point, the Coobool Creek results are surprising.

There is a low level of correlation between these variables in this sample, with slight negative correlations between cranial height and the variables defining prognathism. This is probably a function of cranial deformation, where cranial height is increased both irregularly and disproportionately to facial prognathism, which is apparently not affected. The one moderate correlation involving basion-bregma is with upper facial height ($r=.417$, $P=.078$).

Facial prognathism

There is a moderate to high correlation between the three variables defining facial prognathism. As these three variables are arms of a common reference point, a moderate degree of correlation is to be expected (Solow, 1966:85). Basion-prosthion and alveolar length share a common reference point (prosthion) and cover a similar anatomical region, the length of the palate, and there is a high correlation between these two variables ($r=.71-.79$) in each of the Murray Valley samples. Variables which appear to show a biological relationship with facial prognathism are supraorbital breadth, upper facial height (nasion-prosthion) and alveolar breadth. The Coobool Creek results are essentially the same as those in the Murray Valley sample. There is an allometric association between the distance of the face from the foramen magnum, upper facial breadth, upper facial height and the size of the palate.

Upper facial breadth

The two variables covering the breadth of the upper face (supraorbital breadth and bi-zygomaxillare) display low levels of correlation both with each other and with the other facial variables in the male and female samples. The only exception to this is the moderate correlation between

bi-zygomaxillare and alveolar breadth ($r=.463-.671$). In the pooled Murray Valley sample there is an increase in the level of correlation between the measures of facial breadth and the remaining variables. This is a function of the distance between the male and female means rather than any overall pattern of covariance.

Supraorbital breadth and bi-zygomaxillare are not highly correlated in the Coobool Creek sample ($r=.349$) but show moderate correlation with alveolar length and breadth ($r=.499-.613$) and upper facial height ($r=.636$).

Upper facial height

Nasion-nasospinale and nasion-prosthion are highly correlated ($r=.653-.748$) in each of the Murray Valley samples. This is to be expected, given that these variables share a common reference point and measure essentially the same anatomical region. One factor which would tend to reduce the correlation between these two variables is the independent development of the subnasal region, relative to nasal height. There is almost no correlation between the height of the subnasal region (nasospinale-prosthion) and the height of the nose (nasion-nasospinale) in the Murray Valley samples (Murray Valley males $r= -.053$, Murray Valley females $r= -.040$, pooled $r=.140$). With the exception of the female sample, there is low correlation between the height of the orbit and upper facial height. There is a clear relationship between facial height and overall palate size (alveolar length and breadth) in each of the Murray Valley samples. Alveolar length and breadth are moderately correlated ($r=.459-.462$) in the male and female samples, with a higher correlation ($r=.659$) in the pooled sample. With the exception of a low correlation between alveolar length and breadth ($r=.241$), the Coobool Creek results for upper facial height and palate size agree with the Murray Valley data.

Discriminant analysis

Due to the small size of the female samples from Broadbeach (n=4) and Coobool Creek (n=9) and the fragmentary condition of the Broadbeach male crania, the discriminant analyses are restricted to the Coobool Creek, Murray Valley and Swanport male crania. Basion is not preserved in any of the Kow Swamp crania and this plus damage to the facial skeletons prevented the inclusion of any of these crania in the analysis.

A series of two-group discriminant analyses was run, using a procedure which maximised the Mahalanobis distance between groups. For a discussion of the discriminant procedure and discriminant analysis in general see Section 2. The purpose of the two-group comparisons was to maximise the recovery, and interpretation, of the descriptive statistical information associated with the discriminant runs.

The initial discriminant analysis was between male and female crania from the Murray River Valley. This sex-based interpopulation variation was then contrasted with the intrapopulation variation between the male samples. The four two-group comparisons were followed by a three-group analysis containing the three male groups. The purpose of this analysis was an examination of the probabilities of misclassification, the matrix of pairwise F ratios and distance between the group centroids. Mahalanobis distance, eigenvalues, Wilk's Lambda, canonical correlations and plots of the discriminant scores were examined for each function.

Results

Homogeneity of covariance was tested in each of the discriminant analyses using Box's M. With the exception of the comparison between the Murray Valley males and females, the F values are not significant at the

5 percent level, indicating equality of dispersion between the male groups (Table 69). A significant F value ($P=.03$) in the male-female comparison demonstrates that the covariance matrices are unequal. Lachenbruch and Goldstein (1979) argue that the performance of the linear discriminant function may be affected under these conditions and this should be kept in mind when interpreting the results of the male-female comparison.

TABLE 69: Test for the equality of the group covariance using Box's M

	Box's M	F	Degrees of freedom		P
MV♂-MV♀	0.859	1.383	55,	27287.9	0.0316
CC-MV	0.907	1.035	55,	1343.9	0.4048
CC-SW	0.577	0.772	55,	1850.1	0.8625
MV-SW	0.886	1.174	55,	2721.5	0.1794
CC-MV-SW	0.173	1.070	110,	3271.1	0.2922

Murray Valley male and female crania

A plot of the canonical discriminant function scores for these two groups indicates that there is considerable overlap in range and little distance between the group centroids in this analysis (Figure 23). The group classification results correctly predict the group membership of 84.4 percent of the male crania and 90.0 percent of the females.

The standardised coefficients demonstrate that the major discriminating variables are basion-nasion, alveolar length and breadth and basion-nasospinale. The remaining variables contributing little to the discriminatory power of the function (Table 70). The relative importance of the final function is indicated by its associated eigenvalue and canonical correlation. In this analysis the small eigenvalue and low canonical correlation indicate that this function is less successful at discriminating between the two groups

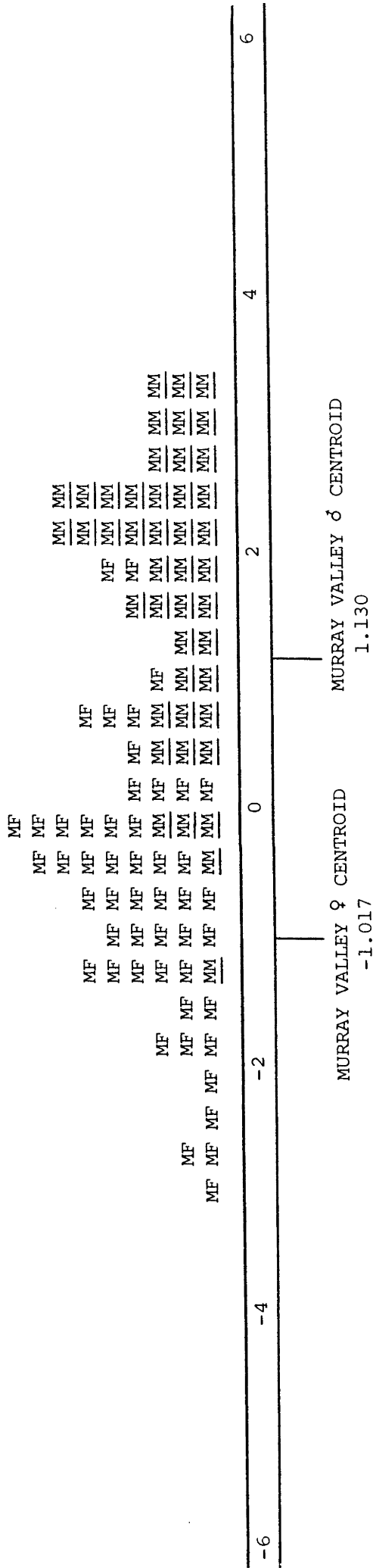


Figure 23. Canonical discriminant analysis of male (n=45) and female (n=50) Aboriginal crania from the Murray River Valley

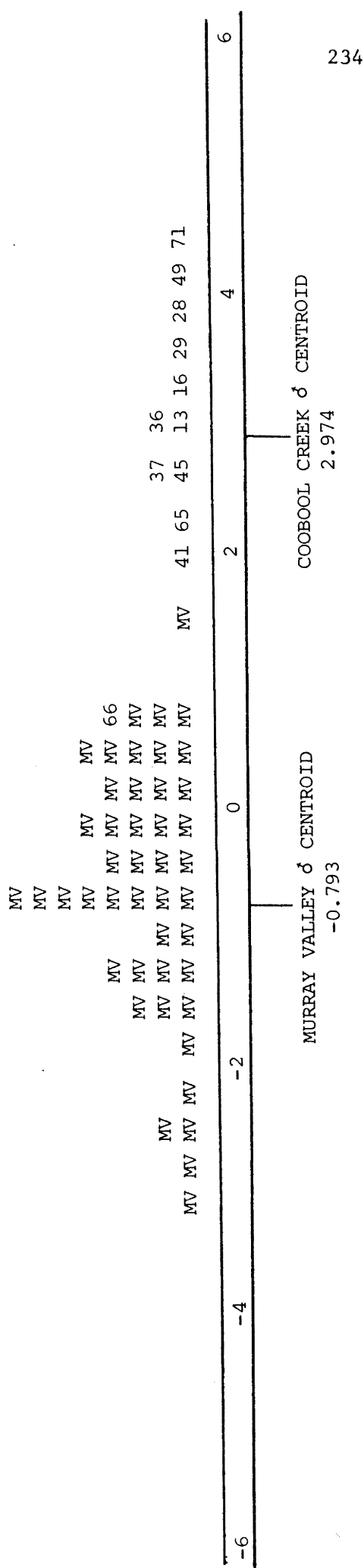


Figure 24. Canonical discriminant analysis of male Aboriginal crania from Coobool Creek (n=12) and the Murray Valley (n=45)

than are the functions developed in the other analyses (Table 71). As these variables were not selected for their ability to sex crania, a particularly wide separation of the group centroids was not expected.

TABLE 70: Standardised canonical discriminant function coefficients for the two group analyses

	MV♂-MV♀	CC♂-MV♂	CC♂-SW♂	MV♂-SW♂
Basion-nasion	-0.688	-0.152	0.532	0.052
Basion-nasospinale	0.230	-0.201	0.846	-0.394
Basion-prosthion	0.118	0.582	-0.403	0.710
Supraorbital breadth	-0.068	0.993	0.248	0.265
Nasion-nasospinale	-0.175	0.791	1.008	0.294
Nasospinale-prosthion	-0.019	0.172	0.978	-0.895
Nasal breadth	-0.066	0.304	0.175	-0.671
Orbital height	0.011	-0.935	-0.530	0.108
Alveolar length	-0.359	-0.893	-0.629	-0.283
Alveolar breadth	-0.346	-0.181	0.248	-0.076

TABLE 71: Eigenvalues, canonical correlations and Wilk's Lambda for the five discriminant analyses

	Eigen- value	% variance	canonical corre- lation	Wilk's Lambda	Chi- squared	DF	P
MV -MV	1.213	100	0.7404	0.4517	69.922	10	0.0000
CC-MV	2.588	100	0.8493	0.2786	63.885	10	0.0000
CC-SW	5.673	100	0.9220	0.1498	40.809	10	0.0000
MV-SW	1.446	100	0.7689	0.4087	48.317	10	0.0000
CC-MV-SW							
Function 1	1.820	62	0.8034	0.1680	116.810	20	0.0000
Function 2	1.109	38	0.7251	0.4741	48.881	9	0.0000

Coobool Creek and Murray Valley male crania

A high level of discrimination is achieved in this analysis, with the group classification results correctly predicting the group membership of all but one of the Murray Valley (97.8 percent) and Coobool Creek (91.7 percent) crania. The plot of the canonical discriminant function scores (Figure 24) demonstrates the wide separation of the group centroids and small overlap in range. The only Coobool Creek cranium to fall within the Murray Valley range is CC66. This individual combines a relatively small face with large orbits and a palate size which is at the lower end of the Coobool Creek range (Plate 14).

The standardised coefficients (Table 70) indicate that four variables (maximum supraorbital breadth, nasion-nasospinale, orbital height and alveolar length) are the major contributors to the discriminatory power of the final function. A combination of great supraorbital breadth, absolutely low orbital height, a high nasal aperture (nasion-nasospinale) and massive palate makes the Coobool Creek crania distinct from the recent Murray Valley series. The Coobool Creek mean values for seven of the 10 facial variables are significantly greater than the Murray Valley means ($P=.020-.000$) (Table 50), with no significant difference between these two samples for nasospinale-prosthion and alveolar length ($P=.519-.691$). The Murray Valley mean value for orbital height is significantly greater than the Coobool Creek mean ($P=.046$). A regional characteristic of recent crania from the central Murray River Valley is the great height and prognathism of the subnasal region and this morphology also distinguishes the Coobool Creek material.

This analysis produced the second largest eigenvalues and canonical correlation of the two-group analyses (Table 71). The distance between the

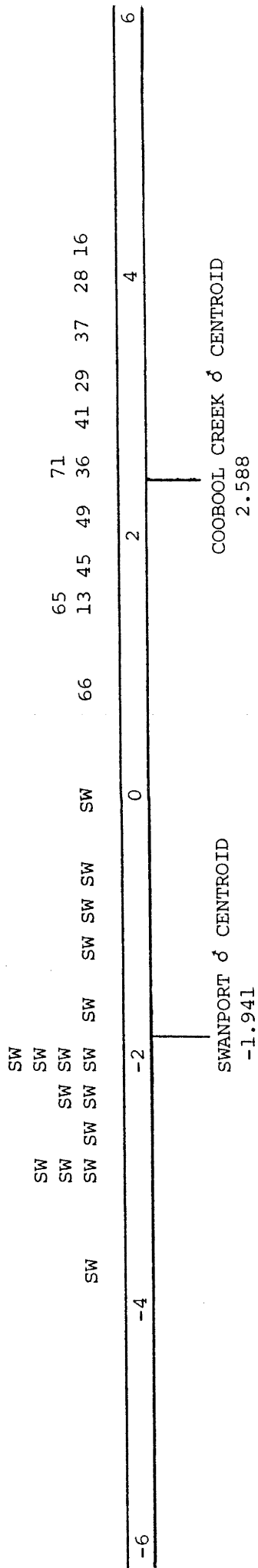


Figure 25. Canonical discriminant analysis of male Aboriginal crania from Coobool Creek (n=12) and Swanport (n=16)

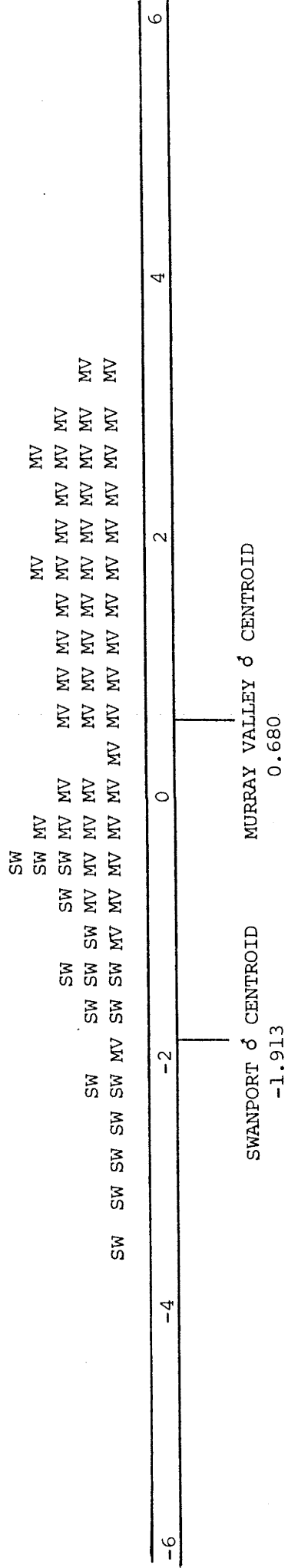


Figure 26. Canonical discriminant analysis of male Aboriginal crania from Swanport (n=16) and the Murray Valley (n=45)

Coobool Creek and Murray Valley centroids is greater than that between the Murray Valley males and females and the group clusters are more discrete.

Coobool Creek and Swanport male crania

These two groups were the most easily differentiated pair in the analysis, with a wide separation of the group centroids and 100 percent correct group classification (Figure 25). As in the preceding comparison, the Coobool Creek cranium falling closest to the Swanport centroid is CC66.

The major discriminating variables between these two groups are nasion-nasospinale, nasospinale-prosthion and basion-nasospinale (Table 70). The univariate statistics indicate that the Coobool Creek mean values for nine of the ten facial variables are significantly greater ($P=.014-.000$) than the Swanport means. The exception is orbital height, in which the Swanport mean is significantly greater ($P=.001$) than the Coobool Creek mean. Unlike the crania from the central Murray River region, the Swanport crania do not possess either great subnasal height or prognathism.

In keeping with the wide separation of the group centroids, this analysis obtained the largest eigenvalue and canonical correlation of the discriminant series. These results are similar to those obtained with the mandibles, in which these two groups represented opposing morphological and metrical extremes. The Swanport oro-facial complex is extremely small and gracile relative to the robustness of the Coobool Creek series.

Murray Valley and Swanport male crania

With the exception of the Murray Valley male-female comparison, these two groups are the most similar in the analysis. The range of the two groups, as defined by the discriminating variables, overlaps and there is little

distance between the group centroids (Figure 26). The classification results placing five of the Murray Valley crania within the Swanport range. The relative importance of this function is indicated by the lower eigenvalue and canonical correlation than in the discriminant runs containing the Coobool Creek series.

The standardised coefficients indicate that three variables (nasospinale-prosthion, basion-prosthion and nasal breadth) are the major sources of discrimination between these crania, with the remaining variables being far less important (Table 70). Statistically significant differences between the mean values for the ten facial variables are present for nasion-nasospinale ($P=.021$), nasion-prosthion ($P=.000$), nasal breadth ($P=.001$), orbital height ($P=.043$) and alveolar length and breadth ($P=.009-.002$) (Table 53). The Swanport means are greater for two of these variables, nasion-nasospinale and orbital height. Relative to the Murray Valley crania, the Swanport crania combine a relatively high nasal aperture (nasion-nasospinale) with little sub-nasal height, large orbits and absolutely small palates.

Coobool Creek, Murray Valley and Swanport

The purpose of the three-group comparison was an examination of the matrix of pairwise F ratios, distance between group centroids and the probabilities of misclassification. The matrix of pairwise F ratios consists of an F ratio for each pair of groups (Table 72). This F is the significance test for the Mahalanobis distance between groups and may be used to test the equality of pairs of centroids (Nie, *et al.*, 1975:460).

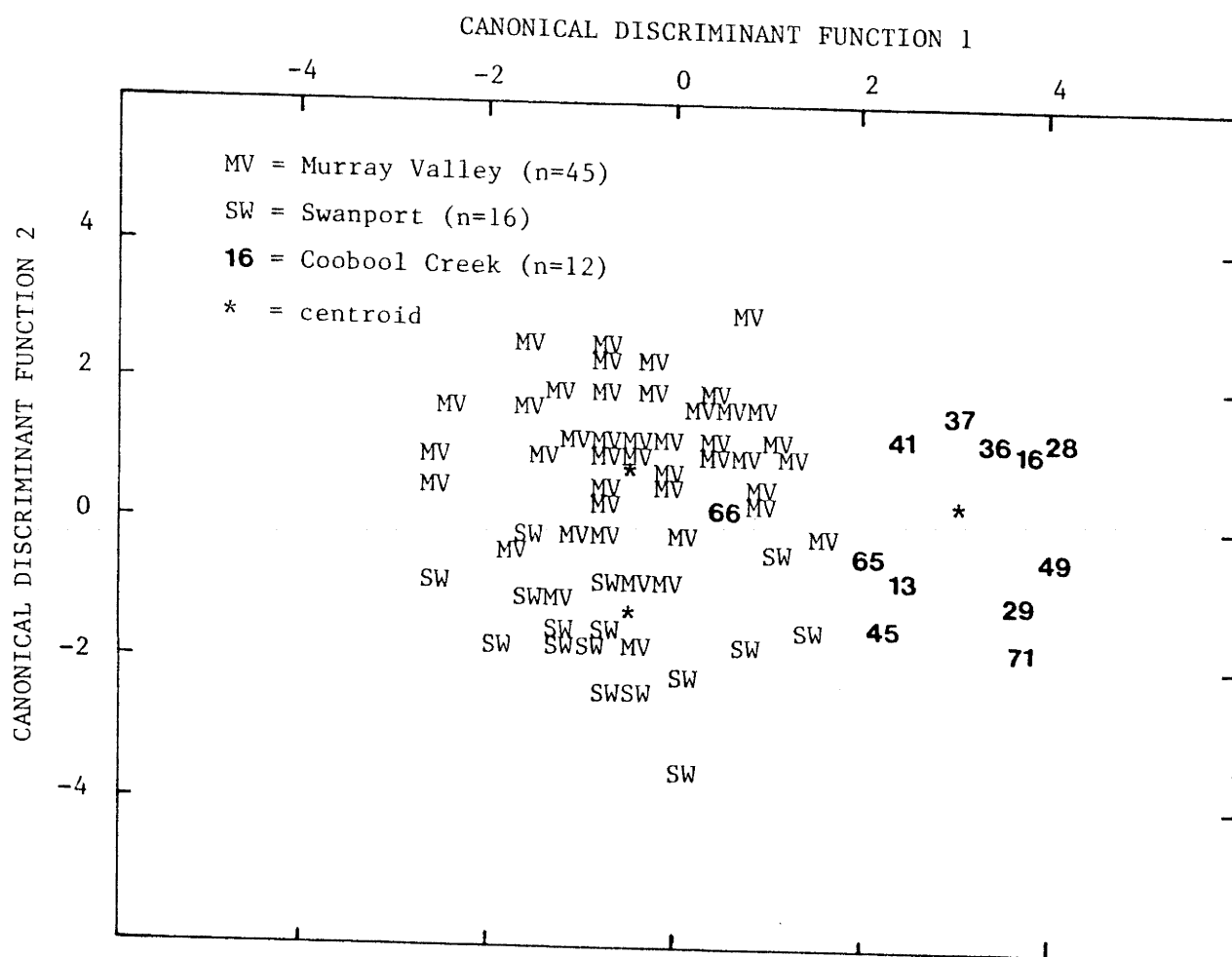


Figure 27. Canonical discriminant function analysis of the facial skeletons of male Australian Aboriginal crania from Coobool Creek, the Murray Valley and Swanport, all groups scatterplot.

TABLE 72: F statistic and significances between pairs of groups

		Murray Valley	Coobool Creek
Coobool Creek	F	15.9080	
	P	0.0000	
Swanport	F	9.8075	14.7040
	P	0.0000	0.0000

Both the F ratios and the plot of the discriminant function scores (Figure 27) demonstrate that the two closest groups in the analysis are the Swanport and Murray Valley series, with the Coobool Creek material being more distinct. The group classification results correctly classify all but one of the crania in the Coobool Creek and Swanport series, both of which are placed within the Murray Valley series. Seven of the Murray Valley crania are placed within the Swanport sample, with a total overlap between these two groups of 11.5 percent (Table 73).

TABLE 73: Group classification results

	n.	Predicted group membership		
		MV	CC	SW
Murray Valley	45	39 86.7%	1 2.2%	5 11.1%
Coobool Creek	12	1 8.3%	11 91.7%	0 0.0%
Swanport	16	1 6.2%	0 0.0%	15 93.7%

Overall there is a high level of discrimination in this analysis, reflecting both regional and temporal variation. The Coobool Creek crania are distinguished from the two recent groups by the massive size of their facial skeletons, with great supraorbital breadth, marked subnasal prognathism and large palates. Within these otherwise large faces, the orbits have a

maximum height which is both absolutely and relatively small. The Swanport facial skeletons represent the contrasting morphological extreme in this analysis, with their absolutely small palates, low subnasal height and prognathism and large orbits. The height of the nasal aperture in the Swanport crania is relatively great in comparison with the height of the subnasal region. The Murray Valley crania are somewhat intermediate between the Coobool Creek and Swanport crania, though they cluster more closely with the Coobool Creek series than do the Swanport crania. In all instances the extent of the regional and temporal variation between the male samples is greater than that between the Murray Valley males and females.

Summary

Morphological, univariate and multivariate comparisons place the Coobool Creek crania firmly within the Kow Swamp range of variation. Both of these populations are distinct from the recent Aboriginal samples used in these analyses.

Thorne's (1975) comparison of the Kow Swamp crania with a recent northern Victorian series demonstrated that the morphological and metrical features distinguishing the two series were concentrated on the face and forehead. Of the 15 statistically significant metrical differences between his two male groups, 12 related to the facial and frontal areas. It should be noted, that the Kow Swamp material is fragmentary, with the best preservation in the facial and frontal areas, and it is likely that with more complete materials significant statistical differences would have been demonstrated for other anatomical regions.

Although the evidence for artificial cranial deformation at Coobool Creek and Kow Swamp conflicts with some aspects of Thorne's interpretation of the Kow Swamp morphology (Thorne and Macumber, 1972; Thorne and Wolpoff, 1981), other aspects of cranial size and morphology (Brown, 1981b) support conclusions about temporal change within the Murray River region and morphological continuity with the Indonesian *Homo erectus* material.

The morphological pattern shared by the Coobool Creek and Kow Swamp crania reflects a combination of genetic, cultural and environmental factors. It was Brothwell (1975) who made the initial suggestion that the frontal recession evident in the Kow Swamp crania was too extreme to be natural and represented artificial deformation rather than the preservation

of an archaic morphotype. My own analysis (Brown, 1981b) confirms Brothwell's hypothesis, demonstrating that several of the crania from Coobool Creek and Kow Swamp are artificially deformed. Anatomical features which are indicative of deformation are concentrated on the frontal, parietal and occipital regions.

There is a marked recession of the frontal squama, especially in the anterior two-thirds, with posterior displacement of metopion. In association with this frontal recession there is a variable expansion of the frontal diploe in the posterior quarter of the bone, with a constriction of the diploe in the middle third. The anterior-posterior length of the bone is increased and a series of symmetrical depressions may border the midline.

Pressure on the frontal and occipital regions, probably during the first 12 months of life, increases cranial height, with an associated increase in the anterior-posterior curvature of the parietal bones. As a result of this pressure on the occipital and frontal regions there is an increase in cranial breadth.

The occipital bone is flattened and pushed up and under the parietals, with little evidence of an occipital bun. There is an increase in the length of the occipital bone (basion-lambda) and the posterior third of the foramen magnum is drawn upward toward lambda.

The isolation of those anatomical regions unaffected by cranial deformation is a necessary prerequisite to an analysis of temporal and regional variation. The analysis of cranial deformation, combined with the preceding univariate and morphological comparison, indicates that the area least likely to be influenced by deformation is the facial skeleton.

A stronger argument can be made for this in the Coobool Creek crania than in the American Indian examples (Cybulski, 1975). Deformation of American infant crania through the use of cradle boards and head bindings results in more extensive alterations in vault morphology than is evident in the Coobool Creek and Kow Swamp crania. In the Australian crania the anatomical modifications indicative of artificial deformation are relatively slight. With this more subtle deformation of the cranial vault the morphology of the facial skeleton is less likely to be influenced by the deformation process.

The facial skeletons in the Coobool Creek and Kow Swamp crania are characterised by an anatomical complex which is distinct from that in the recent comparative series. The subnasal region reflects the predominating influence of the large anterior teeth, with their long and thickened roots. This has resulted in marked subnasal height, prognathism and breadth, with a relatively straight alignment of the anterior teeth. The Coobool Creek and Kow Swamp palates are long, high and extremely broad, with a tendency for maximum alveolar breadth to be located posterior to the second molar.

The zygomatic bones are deep, thickened structures with prominent malar tuberosities and robust, pillar-like frontal processes. Inferiorly the inferior-posterior border is particularly thickened with a broad area of masseteric attachment.

Superiorly the orbits are absolutely shallow, especially given the great facial height, and are most often of rectangular shape with a fairly horizontal orientation. The naso-frontal articulation is extremely broad and there is a wide separation of the orbits. The nasal bones are broad and flattened.

Supraorbital development in the reconstructed Coobool Creek crania does not obtain the development evident in Kow Swamp 1 (Thorne 1975) or in some recent Australian crania. There is relatively little depression at nasion and the glabellae are broad and low, rather than having an inflated, prominent appearance. The long axis of the superciliary ridges is parallel to the superior margins of the orbits and their lateral margins tend to merge with the zygomatic trigones. Distinct supraorbital tori are present in two of the Coobool Creek male crania. Laterally the zygomatic trigones are large and globose, exceeding the development in the recent comparative sample.

Two other general distinguishing characteristics of the Coobool Creek and Kow Swamp crania are their greater overall size and greater thickness of the bones in the cranial vault. A comparison of the mean cranial dimensions in the Coobool Creek and Murray Valley males demonstrates that for 49 of the 63 variables of the Coobool Creek mean is significantly greater than the Murray Valley mean ($P=.05-.00$). Similarly the Coobool Creek female mean values are significantly greater than the Murray Valley female means for 41 of the 63 variables. Comparisons with the Swanport and Broadbeach samples produce similar results.

Thorne and Macumber (1972) describe the major vault bones in the Kow Swamp crania as being 'uniformly thick', though Thorne (1977:191) later restricts this to the facial and frontal regions. The Coobool Creek vaults are not uniformly thick. Several crania (female CC1 and male CC66)

are extremely thin and the thickness of the frontal bone in some of the artificially deformed crania varies from thin in the mid-frontal squama to a thickened pre-bregmatic eminence. However, the mean thickness of the male vaults at bregma, vertex and lambda is still significantly greater than the mean values recorded by Brown *et al.* (1979) for Australian Aborigines from Yuendumu in Central Australia and a series of male crania in the Adelaide Museum. The great vault thickness in the Coobool Creek and Kow Swamp crania may in part be an allometric association between vault thickness and overall vault size. Unfortunately, the Coobool Creek sample is too small to permit a quantification of this.

Multivariate comparison of the oro-facial skeletons in the Coobool Creek, Swanport and Murray Valley samples, using a discriminant function technique, clearly distinguishes the Coobool Creek sample (in terms of absolute size and morphology) from the two recent populations. The Coobool Creek faces are distinguished from those from the Murray Valley and Swanport by their greater supraorbital breadth and facial height, absolutely shallow orbits and larger palates. The Swanport faces can be distinguished from the Murray Valley and Coobool Creek samples by their reduced subnasal height and prognathism and by their narrower nasal apertures. If the Broadbeach crania had been complete enough to include in the discriminant analysis they would have formed a very distinct cluster. The Broadbeach faces are relatively orthognathic, with little facial height or subnasal prognathism and very broad nasal apertures. The overall impression with the Broadbeach crania is that of a low, flat face on a large vault.

SECTION 5

COOBOOL CREEK TOOTH SIZE

5.1 Introduction

The earliest descriptions of the Australian Aboriginal dental complex were limited to brief comments on tooth morphology, tooth size and attrition (Turner, 1884; Topinard, 1872; Duckworth, 1904). The first detailed comparative statements were the astute, though brief, observations of Klaatsch (1908) who combined morphological and metrical description of the teeth and palate with a general account of occlusion and the helicoidal plane in Australian Aborigines.

In 1925 Campbell published his extensive description of the Aboriginal dentition and palate. Over the next decade, increasing interest in functional and epidemiological issues (Campbell and Lewis, 1926; Campbell, 1928, 1937, 1938a, 1938b; Campbell and Gray, 1936; Price, 1938) resulted in Campbell's second major work (Campbell, 1939), in which he examined the functional relationship between diet and the Aboriginal dentition. These two publications (Campbell, 1925, 1939) remain the classic studies in the anthropological literature on the dentition of the Australian Aborigines.

Campbell (1925) was the first to present the mesiodistal and buccolingual crown dimensions of a large sample of Australian Aboriginal dentitions. Using a pooled male and female sample, drawn primarily from South Australia (n=340) and the Northern Territory (n=150), he presented a survey of 'approximately 630' individuals. Unfortunately, as Freedman and Lofgren (1981) note, the subsequent value of these data has been reduced by the pooling of the sample, both in terms of sex and locality, and the limited statistical data published.

Subsequent analyses of Australian Aboriginal tooth size have concentrated on aspects of sexual dimorphism (Barrett, *et al.* 1963a; Barrett, *et al.* 1963b; Barrett, *et al.*, 1964; Macintosh and Barker, 1965; Hanihara, 1976; Brown and Townsend, 1979; Freedman and Lofgren, 1981; Smith, *et al.*, 1981), regional variation (Brace, 1979, 1980; Freedman, 1981; Smith, *et al.*, 1981), the relative contributions of genetic and environmental factors to the variability in tooth size (Townsend and Brown, 1978a, 1978b), and the possibility of temporal reduction in Australian Aboriginal tooth size (Thorne and Macumber, 1972; Thorne, 1975; Freedman and Lofgren, 1979a; Brace, 1980).

Although a considerable amount of information is available on Australian Aboriginal tooth size, there is still an inadequate picture of two of the major areas of contemporary anthropological interest, regional and temporal variation. Until recently this problem has been compounded by problems associated with some of the published data. As noted above for Campbell's work, several studies provide only limited geographical control, combined with no subdivision of the sample according to sex and these shortcomings persists in more recent research (Gabriel, 1955; Macintosh and

Barker, 1965). To some degree the apparent limitations of much of the early work are simply a reflection of recent changes in emphasis and the ongoing sampling problems associated with collections of Australian skeletal material. In this respect it is particularly unfortunate that one of the most recent, and potentially most useful, regional surveys of Australian Aboriginal tooth size, that of Brace (1980), is so full of methodological shortcomings as to compromise any interpretation of the results.

The most comprehensive and detailed descriptions of Australian Aboriginal tooth size stem from the longitudinal growth study of the Walbiri and Pintubi peoples at Yuendumu (Barrett, *et al.*, 1963a; Barrett, *et al.*, 1963b; Barrett, *et al.*, 1964; Townsend and Brown, 1978a, 1978b, 1979). Other sexed regional data are provided by Freedman and Lofgren (1981) for 52 male and 29 female skeletons from Western Australia and Smith, *et al.*, (1981) for Broadbeach, Roonka, Swanport, Anson Bay and Melville Island. As Freedman and Lofgren note (1981:87), 'such data are, of course, necessary for the analysis of dental variation within Australia and for comparison with the now extensive amount of recent and fossil cranial material available from various parts of the continent'.

With the excavation of the large skeletal series from Broadbeach (Haglund, 1976) and Roonka (Pretty, 1977) it is now possible to compare tooth size data obtained from Australian Aboriginals from Yuendumu (Barrett, *et al.*, 1963a; Barrett, *et al.*, 1963b; Barrett, *et al.*, 1964) with those of populations from contrasting environments.

Tooth size data has also been presented for some of the 'fossil' Australian crania. Smith (1918) and Macintosh (1952c) both describe the dentition of the Talgai cranium, Macintosh (1952b) the teeth and palate of the Cohuna cranium and Adam (1943) those of the Keilor cranium, while

Davies (1968) presents a detailed description of the isolated maxillary medial incisor from Devil's Lair in Western Australia dated to between 12,000 and 8,000 years BP. Although a detailed comparison of the Kow Swamp dentitions has not been published, Thorne and Macumber (1972) provide data for KS1 and KS5. Most recently Freedman and Lofgren (1979a) compare the odontometric data for the Cossack skeleton with data recorded for other Australian prehistoric skeletal material. Morphological and metrical descriptions of the dentitions in the Nitchie (Macintosh, 1971), Mungo 1 (Thorne, 1975; Thorne and Wilson, 1977) and Mungo 3 (Bowler and Thorne, 1976) specimens have not been published.

My approach to the description of the Coobool Creek dentitions, and the eventual restriction of this to a comparison of tooth breadths, was dictated by the nature of the material. Dental attrition is marked in most of the reconstructed Coobool Creek specimens, with large areas of dentine exposed on the occlusal surfaces of the teeth, combined with great interproximal attrition. With two exceptions (the young adult females CC1 and CC9) this high degree of attrition has removed most of the surface morphological detail from the teeth. Information as to cusp number, occlusal fissure pattern, degree of shovelling of the anterior maxillary incisors and the presence of hyperplastic abnormalities is not preserved. For this reason no attempt was made to present a detailed morphological description of the dentitions.

The rate and extent to which teeth wear is a response to a combination of factors of both biological and cultural origin (Richards and Brown, 1981b). Biological factors include tooth morphology and occlusion and the physical and chemical properties of the dental hard tissues. The principal

cultural factors include diet, the physical properties of the food bolus, the extent to which food has been prepared prior to mastication and the use of the teeth in non-masticatory contexts (Campbell, 1925, 1939; Howell and Brudevold, 1950; Anderson and Picton, 1957; Molnar, 1971; Xhonga, 1977; Richards and Brown, 1981b).

Initial descriptions of the Australian dentition (Turner, 1884) noted the high degree of tooth wear, with the rapid loss of hard tissue in the deciduous and permanent dentition (Campbell, 1925:65; Murphy, 1964). This is primarily a function of the abrasiveness of the traditional Aboriginal diet, minimal pre-masticatory preparation of food (Beveridge, 1883: 36-38; Curr, 1883:238-250; Campbell, 1939), and the use of the teeth as tools (Krefft, 1866:361; Beveridge, 1883:42; Curr, 1883:283; Gould, 1968; Barrett, 1977).

In Australian Aboriginals from traditional situations, as soon as the first permanent molar reaches occlusion, interproximal facets begin to develop on the mesial surface of the crown through contact with the deciduous molar. This interproximal wear, which is also found in the deciduous dentition, is a feature of permanent Aboriginal dentitions prior to the introduction of refined European foods. Murphy (1964) described the reduction in the size of the dental arch in Australian Aboriginals which results from interproximal wear and mesial migration. For the permanent canines, premolars and molar teeth this interproximal wear results in a rapid reduction of the length of the crown. The morphology of the maxillary and mandibular incisors results in a reduction of their mesiodistal crown dimensions through the combined effects of occlusal and interproximal attrition.

As a result of this interproximal reduction in crown length, the only reliable figures for the mesiodistal dimension in Australian Aboriginal dentitions appear to be those recorded for the Yuendumu series (Barrett, *et al.* 1963a; Townsend and Brown, 1979). Most of the dental casts from Yuendumu have been taken from young adult and sub-adult individuals, who, probably as a result of the large component of refined European foods in the diet (Campbell and Barrett, 1953), generally have only slight interproximal wear.

In contrast to the dental casts from Yuendumu, there was invariably a high degree of interproximal wear, in infants and adults, in the dentitions from Coobool Creek, Murray Valley, Swanport, Roonka, Broadbeach and Kow Swamp which I examined. As a result of this interproximal wear the only dental dimension recorded for this analysis was the buccolingual crown diameter. The buccolingual crown diameter was defined, after Townsend and Brown (1979:20) as 'the greatest distance between the labial or buccal surface and the lingual surface of the tooth crown measured with a sliding caliper held at right angles to the mesiodistal crown diameter of the tooth'. Although there is variation between teeth, due to differing morphology, position in the dental arcade and occlusion, this dimension is generally not influenced by tooth wear until occlusal attrition is quite advanced. This makes the buccolingual dimension more suitable for intrapopulation comparison than the mesiodistal dimension.

5.2 Materials and methods

Adult and juvenile Australian Aboriginal dentitions from Coobool Creek, Kow Swamp, Murray Valley, Roonka, Swanport and Broadbeach were examined, as well as the serial dental casts recorded as part of the longitudinal

growth study of the Walbiri and Pintubi peoples of Yuendumu (Barrett, *et al.*, 1964). With the exception of the Yuendumu series, the buccolingual crown dimensions were recorded for the left and right maxillary and mandibular permanent dentitions using a modified Mitutoyo dial caliper with fine, sharpened beaks. Measurements were recorded to the nearest 0.1mm. Teeth in which the maximum buccolingual dimension had been influenced by occlusal attrition or postmortem damage were excluded from the analysis, as were teeth with anomalous crown morphology. If a tooth was rotated or otherwise malpositioned, measurement was modified accordingly. Occlusal views of the Coobool Creek dentitions, with details of the extent of dental attrition and areas of dentine exposure, are presented in Plates 16 to 32.

With the Coobool Creek, Murray Valley, Swanport and Broadbeach populations the individuals included in the analysis of tooth size are the same as those examined in the analyses of cranial and mandibular size and morphology (Sections 3 and 4). Although I examined all of the dentitions from Roonka, I include here only the dental statistics for seven male crania that can be assigned to Roonka phase II, which is dated to the period 4,000-7,000 years BP (Pretty, 1977) (Section 1).

Other comparative data which will be included in the analysis are those recorded for Yuendumu (Barrett, *et al.*, 1964), the Western Australian series examined by Freedman and Lofgren (1981) and data on the recognised *Homo erectus* specimens from the sites at Sangiran, Java, and Choukoutien, China, supplied by M.H. Wolpoff. Most of the *H. erectus* material consists of isolated teeth and I have pooled the material from each site, rather than attempt a subjective subdivision of the samples according to sex. The Indonesian Sangiran sample consists of material from the Trinil and Djertis beds. The Choukoutien sample was excavated from deposits in the lower cave.

Tooth wear, plus postmortem tooth loss and damage, resulted in the full variable set being recorded for very few dentitions. As a result of the incomplete data set, statistical analyses were confined to univariate and bivariate comparisons of tooth breadth. For the descriptive statistics in Tables 76-79 dimensions from the left side of the dental arch are used, with the right side substituted where the left was not preserved. Student's *t* test is used to assess the significance of differences in the sample means and Snedecor's *F* value differences in variance. Where there is a statistical significance in variance, *t* is calculated using the formula based on a separate variance estimate (Nie, *et al.*, 1975:270). Coefficients of variation ($CV = s \times 100/\bar{X}$) and sex differences in tooth size (male \bar{X} - female \bar{X} /female $\bar{X} \times 100$) (Garn, *et al.*, 1964) are calculated for each sample.

Tooth breadth data could not be tested against the normal distribution as the samples were too small (<50) to obtain meaningful results for skewness and kurtosis (Pearson and Hartley, 1972) and the Shapiro-Wilk program (*W*) for testing normality in small samples (<50) would not operate with decimalised data (program SHPWLK, E. Pittelkow, Computer Services, A.N.U.). As the high frequency of missing data, especially in the Coobool Creek sample, precluded multivariate comparison of the samples, I did not consider that it was essential to demonstrate distributional normality.

Measurement error

Townsend and Brown (1979 :21) examine experimental error in tooth measurement. They find that measurement procedures are subject to error of two types: 'systematic errors arising from limitations in the materials and instruments used and accidental errors dependent on the consistency with which repeated determinations can be made by the same observer'.

Human teeth are difficult to measure accurately. They are irregularly shaped objects and in order to obtain reproducible measurements at fine tolerances (0.1mm), it is essential to standardise measurement procedure and equipment. Fortunately an accurate test of both equipment and procedure is provided by replicability studies (Hunter and Priest, 1960; Townsend and Brown, 1979).

Forty crania and mandibles, with reasonably complete dentitions, were selected from the Murray Black collection of the Australian Institute of Anatomy, Canberra. I measured the teeth of these specimens in 1979 and again in 1981. The available number of paired observations ranged between 14 and 37. Differences between the first and second determinations were analysed by computing the standard deviation of a single determination (Dahlberg, 1940) (Table 74). These results were then compared with those obtained in other replicability studies.

TABLE 74: Experimental error in the measurement of the buccolingual crown diameter in 40 crania from the Murray River Valley determined by the method of Dahlberg (1940).

Tooth	MAXILLA				MANDIBLE			
	n	Left	n	Right	n	Left	n	Right
I1	15	.08	14	.09	16	.10	21	.08
I2	24	.08	22	.08	23	.09	26	.09
C	23	.07	29	.08	30	.06	30	.08
P1	25	.06	28	.04	30	.07	32	.07
P2	28	.08	27	.04	31	.11	28	.06
M1	28	.09	31	.06	26	.11	23	.13
M2	35	.07	37	.06	31	.10	31	.06
M3	31	.15	32	.10	35	.09	37	.17
		\bar{X} .09		\bar{X} .07		\bar{X} .09		\bar{X} .09

The magnitude of measurement error using Dahlberg's statistic ranged from 0.04 to 0.17mm, with 19 of the 32 observations being less than 0.09mm. I found that the most difficult teeth on which to obtain reproducible measurements were the maxillary and mandibular third molars, where error ranged from 0.09 to 0.17mm. This is undoubtedly a result of the great morphological variation in these teeth. The mean error for the combined maxillary and mandibular buccolingual crown dimensions is 0.09mm. This compares favourably with the mean error obtained for the buccolingual dimension in other studies: Moorrees, *et al.*, (1957) 0.09mm, Barrett, *et al.*, (1963a) 0.13mm, Townsend and Brown (1979) 0.11mm, and for deciduous teeth (Margetts and Brown, 1978) 0.15mm.

In relation to the size of the teeth in this analysis, measurement error is extremely low, ranging from 0.04mm for the right maxillary P1 and P2 to 0.17mm for the right mandibular M3. A comparison of the mean crown dimensions recorded in 1979 with those recorded for the same teeth in 1981, using Student's *t*, did not produce any significant results.

5.3 Sexual dimorphism

The degree of sexual dimorphism in the buccolingual crown dimension was examined in the Coobool Creek, Murray Valley, Swanport, Yuendumu and Western Australian samples (Tables 75-79). The Broadbeach female sample (n=4) was considered too small for meaningful comparison, so this series was excluded from the analysis.

Coobool Creek

The mean values for male tooth breadths in the Coobool Creek maxillary and mandibular dentitions exceed the female means for all but the mandibular M3, which has a significantly greater mean in the female

Table 75. Sexual dimorphism in the buccolingual crown dimension in Australian Aboriginal populations

MAXILLARY DENTITION

	Coobool Creek		Murray Valley		Swanport		Yuendumu ¹		Western Australia ²		All groups \bar{X}	
	Dimorphism %	Rank	Dimorphism %	Rank	Dimorphism %	Rank	Dimorphism %	Rank	Dimorphism %	Rank	Dimorphism %	Rank
I1	3.99	15	5.48	7	4.59	10	6.00	3	6.45	4	5.30	12
I2	4.76	13	4.89	11	8.63	2	5.08	6	5.39	11	5.75	7
C	6.37	10	9.31	2	5.76	7	5.19	5	8.86	3	7.10	4
P1	11.84	2	5.75	6	6.08	6	2.77	13	5.30	12	6.35	5
P2	5.74	11	6.41	3	5.61	9	2.78	12	6.08	6	5.32	10
M1	3.98	16	3.95	15	2.14	14	3.43	8	5.88	8	3.88	16
M2	7.38	9	5.28	9	6.65	4	3.30	10	6.06	7	5.73	8
M3	4.99	12	6.17	4	9.80	1	9.01	1	5.61	10	7.12	3

MANDIBULAR DENTITION

I1	10.71	4	4.42	13	5.65	8	6.67	2	12.71	1	8.03	1
I2	4.46	14	3.05	16	2.16	13	5.73	4	6.35	5	4.35	13
C	11.23	3	9.74	1	4.22	11	3.23	11	11.29	2	7.94	2
P1	9.31	6	5.16	10	6.13	5	1.61	16	4.72	13	5.39	11
P2	10.39	5	3.96	14	2.20	12	2.34	9	2.15	16	4.21	15
M1	14.39	1	4.73	12	1.58	15	3.58	7	5.63	9	5.98	6
M2	7.88	8	5.43	8	1.20	16	2.74	14	4.01	14	4.25	14
M3	8.68	7	6.07	5	7.99	3	2.24	15	3.65	15	5.73	8
Maxillary \bar{X}	6.13		5.91		6.16		4.70		6.20		5.82	
Mandibular \bar{X}	9.63		5.32		3.89		3.52		6.31		5.74	
Max + Mand \bar{X}	7.88		5.61		5.02		4.10		6.25		5.78	

¹raw data from Barrett et.al. 1964. ²raw data from Freedman and Lofgren 1981.

sample ($P=.052$). The male means are significantly greater than the female means ($P=.042-.000$) for the maxillary and mandibular C, P1, P2, M1 and M2.

Individual dimorphism values range from 14.39 percent (mandibular M1) to 3.98 percent (maxillary M1). Sexual dimorphism was most clearly expressed in the mandibular M1, maxillary P2, mandibular C and mandibular I1. However, the samples for several of these comparisons are extremely small and too much emphasis should not be placed on the results. The average dimorphism figure for the maxillary and mandibular teeth in this sample is 7.88 percent.

Murray Valley

In this comparison the male means exceed the female means for each tooth, with the male means being significantly greater ($P=.039-.000$) for all but the mandibular I2 ($P=.060$).

Dimorphism values range from a maximum of 9.74 percent (mandibular C) to a minimum of 3.05 percent (mandibular I2). Sexual dimorphism was most clearly expressed by the mandibular and maxillary canines, the remaining teeth being much less dimorphic. The average dimorphism for the combined maxillary and mandibular dentition is 5.61 percent, which is less than that in the Coobool Creek sample.

Swanport

Although, as in the Murray Valley sample, the Swanport male mean values exceed the female means for each tooth, the Swanport dentitions are considerably less dimorphic than the Coobool Creek and Murray Valley series. Significant differences between the male and female means are present for only eight teeth, the maxillary I2, C, P1, P2, M2 and M3 and the mandibular

P1 and M3 ($P=.030-.000$). A surprising result is the low level of dimorphism for the mandibular and maxillary canines.

Individual dimorphism values range from 9.80 percent (maxillary M3) to 1.20 percent (mandibular M2). The most dimorphic teeth in this comparison are the maxillary M3 and I2 and the mandibular M3. Mean dimorphism, at 5.02 percent, is less than that in the Coobool Creek and Murray Valley samples.

Discussion

Comparison of the results obtained with the Coobool Creek, Murray Valley and Swanport dentitions with those for Yuendumu (Barrett, *et al.*, 1964; Brown and Townsend, 1979) and a Western Australian sample (Freedman and Lofgren, 1981) indicate the great regional variation in the expression of sexual dimorphism in tooth size.

Brown and Townsend's (1979) examination of tooth size dimorphism in Yuendumu, which did not include the third molars, found that for the buccolingual dimension the most dimorphic teeth were the maxillary C and I1, followed by the mandibular C and maxillary M2.

A control on the effect of sampling on the dimorphism values obtained for Australian Aboriginal tooth size was obtained by calculating the dimorphism percentages for Yuendumu from the data reported by Barrett, *et al.*, (1964). These data were then compared with those obtained by Brown and Townsend (1979). There was only a moderate agreement between the dimorphism values obtained in these two studies. This, plus the results in Table 75, suggests the effects of sampling and the great variation in dimorphism that is present for Australian Aboriginal tooth size.

From the data of Barrett *et al.*, (1964) the most dimorphic teeth in the Yuendumu series are the maxillary M3, mandibular I1 and maxillary I1. Unlike Brown and Townsend's (1979) data, the maxillary and mandibular canines are not particularly dimorphic.

Comparison of the results for the five Australian samples indicates the great variation in the expression of dimorphism for the buccolingual crown dimension in Australian populations. The only pattern to the individual tooth rankings is that the maxillary M1 and mandibular P1 and M2 consistently display less dimorphism than the other teeth. Ranking of the overall mean dimorphism values yields some surprising results, with sexual dimorphism most clearly expressed in the mandibular I1 and C, followed by the maxillary M3 and C.

Sexual dimorphism for the buccolingual crown dimension is greatest in the Coobool Creek sample, with the least dimorphism at Yuendumu. The other groups are intermediate, though closer to Yuendumu than Coobool Creek. It should be noted that the Coobool Creek series is by far the smallest sample in the analysis and, due to the high interpopulation variation that is present for tooth size dimorphism, these results may simply be an artifact of sampling.

5.4 Coobool Creek tooth breadth

The descriptive statistical data for the Coobool Creek, Murray Valley, Swanport and Broadbeach series are presented in Tables 76-79, with a comparison of the tooth breadth data recorded for sexed Australian samples in Tables 80 and 81.

Maxillary medial incisor

The Coobool Creek medial incisors are large with a prominent cingulum on the lingual surface. The roots are long, robust and conical, in some specimens reaching to within a few millimeters of the nasal aperture. The degree of shovelling on the lingual surface of the central and lateral incisors can be assessed in six of the Coobool Creek maxillae (CC1, CC12, CC16, CC28, CC40 and CC45). There is moderate development of the lingual fossa, with slight marginal ridges in CC1. In this specimen the shovelling is more marked on the remaining lateral incisor, which has a distinct lingual tubercle. Shovelling in the remaining individuals varies from a trace (CC28, CC40 and CC45) to absent (CC12 and CC45). In each instance the fossae are more developed on the lateral incisors.

The Coobool Creek male mean buccolingual dimension is exceeded by the small samples from Roonka (n=2) and Kow Swamp (n=2), but is greater than that in the other comparative samples, although not significantly so. A similar result was obtained in the Coobool Creek females.

Maximum medial incisor breadth in the Coobool Creek males (8.7mm) is exceeded by the maximum figures for the Swanport, Murray Valley and Broadbeach series (8.8-9.2mm). The Coobool Creek female maximum (8.6mm) is exceeded by the maximum in the Swanport females (8.7mm).

Maxillary lateral incisor

The Coobool Creek lateral incisors are distinctive. In both size and morphology they are more similar to the Coobool Creek medial incisors than are the lateral incisors in the recent comparative samples which I examined. They are large, well formed teeth with a prominent cingulum on the lingual surface and a broad cervical margin. The roots are long and thickened.

Similarly the few preserved lateral incisors from Kow Swamp are also large and robust teeth. The right lateral incisor in CC37 was probably congenitally absent.

The mean buccolingual crown dimensions for the Coobool Creek male and female lateral incisors are significantly greater than those in the comparative male and female series ($P=.05-.001$). Maximum lateral incisor breadth in this analysis is shared by the Coobool Creek and Swanport males (8.4mm) and females (7.8mm). The coefficients of variation for the Coobool Creek lateral incisors indicate that there is less variation in these teeth than there is in the comparative populations.

Maxillary canine

In the Coobool Creek dentitions these teeth are distinguished by their great breadth at the cervical margin, with a prominent cingulum and long, column-like roots. Occlusal attrition has removed the cusps from most of the Coobool Creek canines, exposing large areas of dentine, though in most instances tooth wear has not proceeded past the cemento-enamel junction.

Mean canine breadth in the Coobool Creek males is greater than that in the comparative samples but this is significant only when compared with the Yuendumu and Western Australian males ($P=.05-.01$). Similarly, the Coobool Creek female mean is greater than that for the other female samples. This is significant only when compared with the Western Australian females ($P=.05-.01$).

Maximum canine breadth in the Coobool Creek males (10.6mm) is exceeded by the maxima in the Murray Valley (11.2mm) and Broadbeach (11.1mm) males. The Coobool Creek female maximum (9.8mm) is exceeded by the Murray Valley female maximum (10.0mm).

Maxillary premolars

In Australian Aboriginal dentitions the crowns of the two maxillary premolars are generally of similar size and morphology, with the first premolar slightly larger than the second and often with a slightly larger buccal cusp. The Coobool Creek premolars are similar in size and morphology. Occlusal attrition has removed the cusps in most specimens, exposing varying amounts of dentine. The left maxillary P2 in CC45 is rotated and displaced lingually.

Mean premolar breadth in the Coobool Creek males is greater than that in the comparative male samples, with a significant result for P1 and P2 in comparisons with the Yuendumu and Western Australian samples ($P=.05-.01$). The Coobool Creek female premolars are larger than the other female samples but not significantly so.

Maximum premolar breadth in the Coobool Creek males (P1 11.8mm, P2 11.7mm) is exceeded by the maxima in the Swanport (P1 12.1mm, P2 12.3mm) and Murray Valley (P1 12.0mm, P2 12.4mm) males. The Coobool Creek female means for P1 and P2 are exceeded by the Murray Valley females.

Maxillary first molar

In the Coobool Creek series the large mean breadths of the maxillary first molars makes these teeth distinct. The mean buccolingual dimension of these teeth in the Coobool Creek males is significantly greater than that in the comparative male samples ($P=.05-.001$), with the exception of Kow Swamp which has a sample of only two. The Coobool Creek female mean, while larger than that in the comparative female samples, is significant only in comparison with the Yuendumu and Western Australian series ($P=.05-.01$).

There is less variation in the breadth of the first maxillary molar in the Coobool Creek males than in the recent male samples.

Maximum first molar breadth in the Coobool Creek males (14.1mm) is exceeded by the maxima in the Murray Valley (14.7mm) and Swanport (14.2mm) males. The Coobool Creek female maximum (13.9mm) is less than the Swanport female maximum (14.1mm).

Maxillary second molar

For the buccolingual dimension in Australian Aboriginal dentitions, the second molar is typically the largest tooth in the molar series (Campbell, 1925:12). This tooth has the largest mean buccolingual dimension in the Coobool Creek male molars but not in the female maxillary molars.

The mean breadth of these teeth in the Coobool Creek males is greater than that in the comparative samples but this is significant only when compared with the small molars in the Yuendumu and Western Australian samples ($P=.009-.001$). In the Coobool Creek female sample the mean second molar breadth is less than the Murray Valley female maximum, but is significantly greater than the Yuendumu and Western Australian means ($P=.05-.01$).

The maximum second molar breadth recorded for the Coobool Creek males (15.3mm) seems slight in comparison with that recorded for one massive tooth from Swanport (16.2mm) and is also less than the Murray Valley maximum (15.7mm). The Coobool Creek female maximum (13.8mm) is also exceeded by the female maxima at Swanport (14.0mm) and the Murray Valley (14.6mm).

Maxillary third molar

In terms of size and morphology this tooth shows the greatest variation in the maxillary arch (Campbell, 1925:12). Although there is greater variation in the breadth of these teeth in the Coobool Creek

sample than in M1 and M2, the majority have large robust crowns. There are no reduced, peg-like third molars, although there is a congenital absence of the right maxillary M3 in CC65.

Mean breadth of the maxillary third molar in the Coobool Creek males is exceeded by the maxima in the Murray Valley and Kow Swamp groups. The Coobool Creek male mean is significantly greater than the Yuendumu and Western Australian male means ($P=.05-.001$). The Coobool Creek female mean is the largest in the female comparison but also has the greatest variance. The mean buccolingual dimension here is significantly greater than in the Western Australian females ($P=.05-.01$).

Maximum third molar breadth in the Coobool Creek males (14.4mm) is less than the maximum in the comparative samples (Murray Valley 16.3mm) and the Coobool Creek female maximum (13.8mm) is also less than the Murray Valley female maximum (14.1mm).

Supernumerary maxillary teeth

The only supernumerary tooth in the reconstructed Coobool Creek dentitions is a unilateral right fourth molar in CC46. Turner (1900), Klaatsch (1902, 1908) and Campbell (1925) describe fourth molar teeth in Australian Aborigines. Campbell's (1925:25) survey indicated that the fourth molar was the most frequent supernumerary tooth, with a frequency in 600 individuals of one percent.

Mandibular incisors

The mandibular incisors are similar in size and morphology in Australian Aboriginal dentitions, with the lateral incisor generally slightly larger than the medial one. Crowding of the mandibular incisors is present in four of the Coobool Creek mandibles (CC1, CC12, CC16 and CC28), with both

buccal and lingual displacement of the medial and lateral incisors.

Due to their short, straight roots and relatively fragile structure, these teeth are often lost or damaged in Australian collections and their sample sizes in the Coobool Creek, Kow Swamp, Roonka and Swanport series are small for statistical purposes. The Coobool Creek male medial and lateral incisors are similar in breadth, though the medial incisor sample is small and there is greater variation in the lateral incisors. The Coobool Creek male means for I1 and I2 are greater than the mean values in the comparative samples but the results are not significant.

Maximum breadth in the Coobool Creek male mandibular incisors (I1 7.1mm, I2 7.6mm) is less than the maxima in the Murray Valley male sample (I1 7.8mm, I2 7.8mm). The Coobool Creek female maximum for I2 (7.5mm) is less than the Murray Valley female maximum (7.6mm).

Mandibular canine

The large size of the Coobool Creek mandibular canines makes these teeth distinctive. They have great breadth at the cervical margin, with moderate cingula on the lingual surface and long, thickened roots.

Mean canine breadth in the Coobool Creek males is significantly greater than that in the Roonka, Swanport, Broadbeach, Yuendumu and Western Australian males ($P=.05-.001$). The Coobool Creek female mean, while greater than the comparative samples, is significant only when compared with the Western Australian female mean ($P=.05-.01$).

Maximum canine breadth in the Coobool Creek male (9.8mm) and female (8.9mm) sample is exceeded by the Murray Valley males (10.1mm) and females (9.1mm).

Mandibular premolars

There is considerable variation in size and morphology in Aboriginal mandibular premolars. The second premolar generally has a greater maximum buccolingual crown dimension than the first, though the first premolar, which may be slightly sectorial, may have a greater mesiodistal crown dimension.

The Coobool Creek mandibular premolars are distinguished by their great size. The second premolar is particularly distinct. This tooth tends to be slightly molariform, with a marked lingual extension of the crown and two prominent lingual cusps (CC9, CC16, CC28, CC32, CC40 and CC71). The first premolar, while also extremely broad, is in some instances slightly elongated and sectorial, with a more prominent buccal cusp than in the second premolar (CC9, CC28, CC45).

The mean breadth of the first premolar in Coobool Creek males is significantly greater than the mean values for the Murray Valley, Roonka, Yuendumu and Western Australian samples ($P=.05-.001$). In Coobool Creek females the mean breadth of P1 is less than the Swanport female mean and is not significantly greater than any of the comparative female samples. The maximum breadth of P1 in the Coobool Creek males (10.7mm) exceeds the maximum recorded for the comparative male samples (10.2mm Broadbeach and Swanport). The Coobool Creek female maximum (9.6mm) is also greater than that recorded for the comparative female samples (9.4mm Swanport).

The mean breadth of P2 in the Coobool Creek males is significantly greater than the means for the comparative male groups ($P=.05-.001$), with the exception of the small Kow Swamp sample. In the Coobool Creek females the mean breadth of this tooth is greater than the mean values for the other samples, but is significant only when compared with the Swanport series.

($P=.05-.01$). The maximum buccolingual crown dimension for the Coobool Creek male second premolars (11.0mm) exceeds the maximum recorded for the other male samples (10.4mm Broadbeach and Murray Valley). The Coobool Creek female maximum (9.5mm) is less than the Murray Valley female maximum (10.0mm).

Mandibular first molar

The mandibular first molars in the Coobool Creek series are large and robust teeth with great buccolingual breadth. The mean breadth of this tooth in the Coobool Creek male sample is significantly greater than that in all of the comparative male groups ($P=.05-.001$), with the exception of the small Roonka sample ($n=4$). Variation in first molar breadth in the Coobool Creek males is considerably less than that recorded for the other male groups. The Coobool Creek female sample is small ($n=3$) and the mean breadth for M1 in this group is less than that in the comparative female samples. The mean breadth of the Swanport female M1 is significantly greater than the Coobool Creek female mean ($P=.05-.01$). This is the only example of a mean tooth breadth being significantly greater than a Coobool Creek mean value.

Maximum first molar breadth in the Coobool Creek males (13.3mm) is less than the maximum dimensions recorded for Swanport (13.6mm) and the Murray Valley (13.5mm). The Coobool Creek female maximum (11.7mm) is less than the maxima recorded for the comparative female samples (Swanport 13.2mm).

Mandibular second molar

This is also a large, well formed tooth in the Coobool Creek sample, with less variance for the buccolingual crown dimension than in the comparative male series.

Mean second molar breadth in the Coobool Creek males is significantly greater than the mean values recorded for Roonka, Swanport, Broadbeach, Yuendumu and Western Australia ($P=.05-.001$). The Coobool Creek male mean is greater than the Murray Valley male mean but not significantly so. Both the Murray Valley and Swanport female mean breadths for M2 are greater than the Coobool Creek female mean but this is not significant.

Maximum second molar breadth in the Coobool Creek males (13.2mm) is less than the maximum dimensions recorded for the comparative male samples (Murray Valley 13.6, Swanport 13.5mm). Similarly the Coobool Creek female maximum (12.3mm) is exceeded by the Murray Valley (12.9mm) and Swanport (12.8mm) samples.

Mandibular third molar

The mandibular third molar exhibits greater morphological variation than the preceding two molars and it is generally the smallest tooth in the mandibular molar series. The Coobool Creek third molars are all large, well formed and functional teeth, with no evidence of gross morphological anomalies or congenital absence.

Mean maximum third molar breadth in the Coobool Creek male sample is equal to the maximum mean of the comparative samples (Swanport) and is significantly greater than the Roonka mean ($P=.05-.01$). The Coobool Creek female mean is greater than the comparative female means, but not significantly so.

Maximum third molar breadth in the Coobool Creek males (12.7mm) is less than the maximum figures recorded for the Swanport (13.9mm) and Murray Valley (13.0mm) males. The Coobool Creek female maximum (11.7mm) is also exceeded by the maximum values at Swanport (12.6mm) and the Murray Valley (12.7mm).

Table 76. Buccolingual crown dimensions of the maxillary and mandibular teeth in Coobool Creek males and females (mm.)

MAXILLARY DENTITION																																																																																																																																																																																																																																																																																																																																															
		n	\bar{X}	s	CV	Min.	Max.	% Dimorphism	Rank	F	P	T	P																																																																																																																																																																																																																																																																																																																																		
I ¹	Coobool Creek ♂	7	8.34	0.25	3.00	8.00	8.70	3.99	15	3.45	0.172	1.56	0.149																																																																																																																																																																																																																																																																																																																																		
	Coobool Creek ♀	5	8.02	0.46	5.74	7.50	8.60							I ²	Coobool Creek ♂	10	7.70	0.40	5.19	6.90	8.40	4.76	13	1.02	0.924	1.67	0.118	Coobool Creek ♀	6	7.35	0.40	5.44	6.80	7.80	C	Coobool Creek ♂	11	9.68	0.53	5.48	8.70	10.60	6.37	10	1.21	0.880	2.23	0.042	Coobool Creek ♀	6	9.10	0.48	5.27	8.50	9.80	P ¹	Coobool Creek ♂	9	10.96	0.40	4.38	10.60	11.80	11.84	2	1.40	0.738	3.22	0.007	Coobool Creek ♀	6	9.80	0.34	3.47	9.80	10.70	P ²	Coobool Creek ♂	11	10.87	0.48	4.42	10.20	11.70	5.74	11	2.42	0.221	1.98	0.067	Coobool Creek ♀	6	10.28	0.75	7.30	9.40	11.30	M ¹	Coobool Creek ♂	12	13.60	0.45	3.31	12.80	14.10	3.98	16	2.50	0.207	1.81	0.091	Coobool Creek ♀	5	13.08	0.72	5.50	12.10	13.90	M ²	Coobool Creek ♂	13	13.96	0.82	5.87	12.70	15.30	7.38	9	1.11	0.973	2.40	0.028	Coobool Creek ♀	6	13.00	0.79	6.08	12.10	13.80	M ³	Coobool Creek ♂	12	13.05	0.99	7.59	10.80	14.40	4.99	12	2.09	0.286	1.09	0.293	Coobool Creek ♀	6	12.43	1.43	11.50	10.00	13.80	MANDIBULAR DENTITION														I ¹	Coobool Creek ♂	3	7.03	0.11	1.56	6.90	7.10	10.71	4	37.25	0.053	1.91*	0.153	Coobool Creek ♀	4	6.35	0.70	11.02	5.90	7.40	I ²	Coobool Creek ♂	7	7.02	0.49	6.98	6.40	7.60	4.46	14	1.19	0.781	0.94	0.371	Coobool Creek ♀	4	6.72	0.54	8.04	6.30	7.50	C	Coobool Creek ♂	9	9.21	0.47	5.10	8.20	9.80	11.23	3	1.00	1.00	3.84	0.002	Coobool Creek ♀	7	8.28	0.47	5.68	7.60	8.90	P ¹	Coobool Creek ♂	10	9.63	0.77	8.00	8.30	10.70	9.31	6	1.94	0.432	2.37	0.032	Coobool Creek ♀	7	8.81	0.55	6.24	7.90	9.60	P ²	Coobool Creek ♂	10	10.09	0.57	5.65	9.20	11.00	10.39	5	3.43	0.147	3.95	0.001	Coobool Creek ♀	7	9.14	0.31	3.39	8.60	9.50	M ¹	Coobool Creek ♂	8	12.88	0.38	2.95	12.10	13.30	14.39	1	1.01	1.000	6.31	0.000	Coobool Creek ♀	3	11.26	0.37	3.29	11.00	11.70	M ²	Coobool Creek ♂	11	12.46	0.47	3.77	11.80	13.20	7.88	8	2.01	0.326	3.32	0.005	Coobool Creek ♀	6	11.55	0.66	5.71	10.80	12.30	M ³	Coobool Creek ♂	12	10.20	0.73	7.16	10.20	12.70	-8.68	7	1.05	0.887	2.09	0.052
I ²	Coobool Creek ♂	10	7.70	0.40	5.19	6.90	8.40	4.76	13	1.02	0.924	1.67	0.118																																																																																																																																																																																																																																																																																																																																		
	Coobool Creek ♀	6	7.35	0.40	5.44	6.80	7.80							C	Coobool Creek ♂	11	9.68	0.53	5.48	8.70	10.60	6.37	10	1.21	0.880	2.23	0.042	Coobool Creek ♀	6	9.10	0.48	5.27	8.50	9.80	P ¹	Coobool Creek ♂	9	10.96	0.40	4.38	10.60	11.80	11.84	2	1.40	0.738	3.22	0.007	Coobool Creek ♀	6	9.80	0.34	3.47	9.80	10.70	P ²	Coobool Creek ♂	11	10.87	0.48	4.42	10.20	11.70	5.74	11	2.42	0.221	1.98	0.067	Coobool Creek ♀	6	10.28	0.75	7.30	9.40	11.30	M ¹	Coobool Creek ♂	12	13.60	0.45	3.31	12.80	14.10	3.98	16	2.50	0.207	1.81	0.091	Coobool Creek ♀	5	13.08	0.72	5.50	12.10	13.90	M ²	Coobool Creek ♂	13	13.96	0.82	5.87	12.70	15.30	7.38	9	1.11	0.973	2.40	0.028	Coobool Creek ♀	6	13.00	0.79	6.08	12.10	13.80	M ³	Coobool Creek ♂	12	13.05	0.99	7.59	10.80	14.40	4.99	12	2.09	0.286	1.09	0.293	Coobool Creek ♀	6	12.43	1.43	11.50	10.00	13.80	MANDIBULAR DENTITION														I ¹	Coobool Creek ♂	3	7.03	0.11	1.56	6.90	7.10	10.71	4	37.25	0.053	1.91*	0.153	Coobool Creek ♀	4	6.35	0.70	11.02	5.90	7.40	I ²	Coobool Creek ♂	7	7.02	0.49	6.98	6.40	7.60	4.46	14	1.19	0.781	0.94	0.371	Coobool Creek ♀	4	6.72	0.54	8.04	6.30	7.50	C	Coobool Creek ♂	9	9.21	0.47	5.10	8.20	9.80	11.23	3	1.00	1.00	3.84	0.002	Coobool Creek ♀	7	8.28	0.47	5.68	7.60	8.90	P ¹	Coobool Creek ♂	10	9.63	0.77	8.00	8.30	10.70	9.31	6	1.94	0.432	2.37	0.032	Coobool Creek ♀	7	8.81	0.55	6.24	7.90	9.60	P ²	Coobool Creek ♂	10	10.09	0.57	5.65	9.20	11.00	10.39	5	3.43	0.147	3.95	0.001	Coobool Creek ♀	7	9.14	0.31	3.39	8.60	9.50	M ¹	Coobool Creek ♂	8	12.88	0.38	2.95	12.10	13.30	14.39	1	1.01	1.000	6.31	0.000	Coobool Creek ♀	3	11.26	0.37	3.29	11.00	11.70	M ²	Coobool Creek ♂	11	12.46	0.47	3.77	11.80	13.20	7.88	8	2.01	0.326	3.32	0.005	Coobool Creek ♀	6	11.55	0.66	5.71	10.80	12.30	M ³	Coobool Creek ♂	12	10.20	0.73	7.16	10.20	12.70	-8.68	7	1.05	0.887	2.09	0.052	Coobool Creek ♀	7	11.17	0.75	6.71	9.70	11.70														
C	Coobool Creek ♂	11	9.68	0.53	5.48	8.70	10.60	6.37	10	1.21	0.880	2.23	0.042																																																																																																																																																																																																																																																																																																																																		
	Coobool Creek ♀	6	9.10	0.48	5.27	8.50	9.80							P ¹	Coobool Creek ♂	9	10.96	0.40	4.38	10.60	11.80	11.84	2	1.40	0.738	3.22	0.007	Coobool Creek ♀	6	9.80	0.34	3.47	9.80	10.70	P ²	Coobool Creek ♂	11	10.87	0.48	4.42	10.20	11.70	5.74	11	2.42	0.221	1.98	0.067	Coobool Creek ♀	6	10.28	0.75	7.30	9.40	11.30	M ¹	Coobool Creek ♂	12	13.60	0.45	3.31	12.80	14.10	3.98	16	2.50	0.207	1.81	0.091	Coobool Creek ♀	5	13.08	0.72	5.50	12.10	13.90	M ²	Coobool Creek ♂	13	13.96	0.82	5.87	12.70	15.30	7.38	9	1.11	0.973	2.40	0.028	Coobool Creek ♀	6	13.00	0.79	6.08	12.10	13.80	M ³	Coobool Creek ♂	12	13.05	0.99	7.59	10.80	14.40	4.99	12	2.09	0.286	1.09	0.293	Coobool Creek ♀	6	12.43	1.43	11.50	10.00	13.80	MANDIBULAR DENTITION														I ¹	Coobool Creek ♂	3	7.03	0.11	1.56	6.90	7.10	10.71	4	37.25	0.053	1.91*	0.153	Coobool Creek ♀	4	6.35	0.70	11.02	5.90	7.40	I ²	Coobool Creek ♂	7	7.02	0.49	6.98	6.40	7.60	4.46	14	1.19	0.781	0.94	0.371	Coobool Creek ♀	4	6.72	0.54	8.04	6.30	7.50	C	Coobool Creek ♂	9	9.21	0.47	5.10	8.20	9.80	11.23	3	1.00	1.00	3.84	0.002	Coobool Creek ♀	7	8.28	0.47	5.68	7.60	8.90	P ¹	Coobool Creek ♂	10	9.63	0.77	8.00	8.30	10.70	9.31	6	1.94	0.432	2.37	0.032	Coobool Creek ♀	7	8.81	0.55	6.24	7.90	9.60	P ²	Coobool Creek ♂	10	10.09	0.57	5.65	9.20	11.00	10.39	5	3.43	0.147	3.95	0.001	Coobool Creek ♀	7	9.14	0.31	3.39	8.60	9.50	M ¹	Coobool Creek ♂	8	12.88	0.38	2.95	12.10	13.30	14.39	1	1.01	1.000	6.31	0.000	Coobool Creek ♀	3	11.26	0.37	3.29	11.00	11.70	M ²	Coobool Creek ♂	11	12.46	0.47	3.77	11.80	13.20	7.88	8	2.01	0.326	3.32	0.005	Coobool Creek ♀	6	11.55	0.66	5.71	10.80	12.30	M ³	Coobool Creek ♂	12	10.20	0.73	7.16	10.20	12.70	-8.68	7	1.05	0.887	2.09	0.052	Coobool Creek ♀	7	11.17	0.75	6.71	9.70	11.70																																			
P ¹	Coobool Creek ♂	9	10.96	0.40	4.38	10.60	11.80	11.84	2	1.40	0.738	3.22	0.007																																																																																																																																																																																																																																																																																																																																		
	Coobool Creek ♀	6	9.80	0.34	3.47	9.80	10.70							P ²	Coobool Creek ♂	11	10.87	0.48	4.42	10.20	11.70	5.74	11	2.42	0.221	1.98	0.067	Coobool Creek ♀	6	10.28	0.75	7.30	9.40	11.30	M ¹	Coobool Creek ♂	12	13.60	0.45	3.31	12.80	14.10	3.98	16	2.50	0.207	1.81	0.091	Coobool Creek ♀	5	13.08	0.72	5.50	12.10	13.90	M ²	Coobool Creek ♂	13	13.96	0.82	5.87	12.70	15.30	7.38	9	1.11	0.973	2.40	0.028	Coobool Creek ♀	6	13.00	0.79	6.08	12.10	13.80	M ³	Coobool Creek ♂	12	13.05	0.99	7.59	10.80	14.40	4.99	12	2.09	0.286	1.09	0.293	Coobool Creek ♀	6	12.43	1.43	11.50	10.00	13.80	MANDIBULAR DENTITION														I ¹	Coobool Creek ♂	3	7.03	0.11	1.56	6.90	7.10	10.71	4	37.25	0.053	1.91*	0.153	Coobool Creek ♀	4	6.35	0.70	11.02	5.90	7.40	I ²	Coobool Creek ♂	7	7.02	0.49	6.98	6.40	7.60	4.46	14	1.19	0.781	0.94	0.371	Coobool Creek ♀	4	6.72	0.54	8.04	6.30	7.50	C	Coobool Creek ♂	9	9.21	0.47	5.10	8.20	9.80	11.23	3	1.00	1.00	3.84	0.002	Coobool Creek ♀	7	8.28	0.47	5.68	7.60	8.90	P ¹	Coobool Creek ♂	10	9.63	0.77	8.00	8.30	10.70	9.31	6	1.94	0.432	2.37	0.032	Coobool Creek ♀	7	8.81	0.55	6.24	7.90	9.60	P ²	Coobool Creek ♂	10	10.09	0.57	5.65	9.20	11.00	10.39	5	3.43	0.147	3.95	0.001	Coobool Creek ♀	7	9.14	0.31	3.39	8.60	9.50	M ¹	Coobool Creek ♂	8	12.88	0.38	2.95	12.10	13.30	14.39	1	1.01	1.000	6.31	0.000	Coobool Creek ♀	3	11.26	0.37	3.29	11.00	11.70	M ²	Coobool Creek ♂	11	12.46	0.47	3.77	11.80	13.20	7.88	8	2.01	0.326	3.32	0.005	Coobool Creek ♀	6	11.55	0.66	5.71	10.80	12.30	M ³	Coobool Creek ♂	12	10.20	0.73	7.16	10.20	12.70	-8.68	7	1.05	0.887	2.09	0.052	Coobool Creek ♀	7	11.17	0.75	6.71	9.70	11.70																																																								
P ²	Coobool Creek ♂	11	10.87	0.48	4.42	10.20	11.70	5.74	11	2.42	0.221	1.98	0.067																																																																																																																																																																																																																																																																																																																																		
	Coobool Creek ♀	6	10.28	0.75	7.30	9.40	11.30							M ¹	Coobool Creek ♂	12	13.60	0.45	3.31	12.80	14.10	3.98	16	2.50	0.207	1.81	0.091	Coobool Creek ♀	5	13.08	0.72	5.50	12.10	13.90	M ²	Coobool Creek ♂	13	13.96	0.82	5.87	12.70	15.30	7.38	9	1.11	0.973	2.40	0.028	Coobool Creek ♀	6	13.00	0.79	6.08	12.10	13.80	M ³	Coobool Creek ♂	12	13.05	0.99	7.59	10.80	14.40	4.99	12	2.09	0.286	1.09	0.293	Coobool Creek ♀	6	12.43	1.43	11.50	10.00	13.80	MANDIBULAR DENTITION														I ¹	Coobool Creek ♂	3	7.03	0.11	1.56	6.90	7.10	10.71	4	37.25	0.053	1.91*	0.153	Coobool Creek ♀	4	6.35	0.70	11.02	5.90	7.40	I ²	Coobool Creek ♂	7	7.02	0.49	6.98	6.40	7.60	4.46	14	1.19	0.781	0.94	0.371	Coobool Creek ♀	4	6.72	0.54	8.04	6.30	7.50	C	Coobool Creek ♂	9	9.21	0.47	5.10	8.20	9.80	11.23	3	1.00	1.00	3.84	0.002	Coobool Creek ♀	7	8.28	0.47	5.68	7.60	8.90	P ¹	Coobool Creek ♂	10	9.63	0.77	8.00	8.30	10.70	9.31	6	1.94	0.432	2.37	0.032	Coobool Creek ♀	7	8.81	0.55	6.24	7.90	9.60	P ²	Coobool Creek ♂	10	10.09	0.57	5.65	9.20	11.00	10.39	5	3.43	0.147	3.95	0.001	Coobool Creek ♀	7	9.14	0.31	3.39	8.60	9.50	M ¹	Coobool Creek ♂	8	12.88	0.38	2.95	12.10	13.30	14.39	1	1.01	1.000	6.31	0.000	Coobool Creek ♀	3	11.26	0.37	3.29	11.00	11.70	M ²	Coobool Creek ♂	11	12.46	0.47	3.77	11.80	13.20	7.88	8	2.01	0.326	3.32	0.005	Coobool Creek ♀	6	11.55	0.66	5.71	10.80	12.30	M ³	Coobool Creek ♂	12	10.20	0.73	7.16	10.20	12.70	-8.68	7	1.05	0.887	2.09	0.052	Coobool Creek ♀	7	11.17	0.75	6.71	9.70	11.70																																																																													
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	Coobool Creek ♀	5	13.08	0.72	5.50	12.10	13.90							M ²	Coobool Creek ♂	13	13.96	0.82	5.87	12.70	15.30	7.38	9	1.11	0.973	2.40	0.028	Coobool Creek ♀	6	13.00	0.79	6.08	12.10	13.80	M ³	Coobool Creek ♂	12	13.05	0.99	7.59	10.80	14.40	4.99	12	2.09	0.286	1.09	0.293	Coobool Creek ♀	6	12.43	1.43	11.50	10.00	13.80	MANDIBULAR DENTITION														I ¹	Coobool Creek ♂	3	7.03	0.11	1.56	6.90	7.10	10.71	4	37.25	0.053	1.91*	0.153	Coobool Creek ♀	4	6.35	0.70	11.02	5.90	7.40	I ²	Coobool Creek ♂	7	7.02	0.49	6.98	6.40	7.60	4.46	14	1.19	0.781	0.94	0.371	Coobool Creek ♀	4	6.72	0.54	8.04	6.30	7.50	C	Coobool Creek ♂	9	9.21	0.47	5.10	8.20	9.80	11.23	3	1.00	1.00	3.84	0.002	Coobool Creek ♀	7	8.28	0.47	5.68	7.60	8.90	P ¹	Coobool Creek ♂	10	9.63	0.77	8.00	8.30	10.70	9.31	6	1.94	0.432	2.37	0.032	Coobool Creek ♀	7	8.81	0.55	6.24	7.90	9.60	P ²	Coobool Creek ♂	10	10.09	0.57	5.65	9.20	11.00	10.39	5	3.43	0.147	3.95	0.001	Coobool Creek ♀	7	9.14	0.31	3.39	8.60	9.50	M ¹	Coobool Creek ♂	8	12.88	0.38	2.95	12.10	13.30	14.39	1	1.01	1.000	6.31	0.000	Coobool Creek ♀	3	11.26	0.37	3.29	11.00	11.70	M ²	Coobool Creek ♂	11	12.46	0.47	3.77	11.80	13.20	7.88	8	2.01	0.326	3.32	0.005	Coobool Creek ♀	6	11.55	0.66	5.71	10.80	12.30	M ³	Coobool Creek ♂	12	10.20	0.73	7.16	10.20	12.70	-8.68	7	1.05	0.887	2.09	0.052	Coobool Creek ♀	7	11.17	0.75	6.71	9.70	11.70																																																																																																		
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	Coobool Creek ♀	6	12.43	1.43	11.50	10.00	13.80																																																																																																																																																																																																																																																																																																																																								
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I ¹	Coobool Creek ♂	3	7.03	0.11	1.56	6.90	7.10	10.71	4	37.25	0.053	1.91*	0.153																																																																																																																																																																																																																																																																																																																																		
	Coobool Creek ♀	4	6.35	0.70	11.02	5.90	7.40							I ²	Coobool Creek ♂	7	7.02	0.49	6.98	6.40	7.60	4.46	14	1.19	0.781	0.94	0.371	Coobool Creek ♀	4	6.72	0.54	8.04	6.30	7.50	C	Coobool Creek ♂	9	9.21	0.47	5.10	8.20	9.80	11.23	3	1.00	1.00	3.84	0.002	Coobool Creek ♀	7	8.28	0.47	5.68	7.60	8.90	P ¹	Coobool Creek ♂	10	9.63	0.77	8.00	8.30	10.70	9.31	6	1.94	0.432	2.37	0.032	Coobool Creek ♀	7	8.81	0.55	6.24	7.90	9.60	P ²	Coobool Creek ♂	10	10.09	0.57	5.65	9.20	11.00	10.39	5	3.43	0.147	3.95	0.001	Coobool Creek ♀	7	9.14	0.31	3.39	8.60	9.50	M ¹	Coobool Creek ♂	8	12.88	0.38	2.95	12.10	13.30	14.39	1	1.01	1.000	6.31	0.000	Coobool Creek ♀	3	11.26	0.37	3.29	11.00	11.70	M ²	Coobool Creek ♂	11	12.46	0.47	3.77	11.80	13.20	7.88	8	2.01	0.326	3.32	0.005	Coobool Creek ♀	6	11.55	0.66	5.71	10.80	12.30	M ³	Coobool Creek ♂	12	10.20	0.73	7.16	10.20	12.70	-8.68	7	1.05	0.887	2.09	0.052	Coobool Creek ♀	7	11.17	0.75	6.71	9.70	11.70																																																																																																																																																																															
I ²	Coobool Creek ♂	7	7.02	0.49	6.98	6.40	7.60	4.46	14	1.19	0.781	0.94	0.371																																																																																																																																																																																																																																																																																																																																		
	Coobool Creek ♀	4	6.72	0.54	8.04	6.30	7.50							C	Coobool Creek ♂	9	9.21	0.47	5.10	8.20	9.80	11.23	3	1.00	1.00	3.84	0.002	Coobool Creek ♀	7	8.28	0.47	5.68	7.60	8.90	P ¹	Coobool Creek ♂	10	9.63	0.77	8.00	8.30	10.70	9.31	6	1.94	0.432	2.37	0.032	Coobool Creek ♀	7	8.81	0.55	6.24	7.90	9.60	P ²	Coobool Creek ♂	10	10.09	0.57	5.65	9.20	11.00	10.39	5	3.43	0.147	3.95	0.001	Coobool Creek ♀	7	9.14	0.31	3.39	8.60	9.50	M ¹	Coobool Creek ♂	8	12.88	0.38	2.95	12.10	13.30	14.39	1	1.01	1.000	6.31	0.000	Coobool Creek ♀	3	11.26	0.37	3.29	11.00	11.70	M ²	Coobool Creek ♂	11	12.46	0.47	3.77	11.80	13.20	7.88	8	2.01	0.326	3.32	0.005	Coobool Creek ♀	6	11.55	0.66	5.71	10.80	12.30	M ³	Coobool Creek ♂	12	10.20	0.73	7.16	10.20	12.70	-8.68	7	1.05	0.887	2.09	0.052	Coobool Creek ♀	7	11.17	0.75	6.71	9.70	11.70																																																																																																																																																																																																				
C	Coobool Creek ♂	9	9.21	0.47	5.10	8.20	9.80	11.23	3	1.00	1.00	3.84	0.002																																																																																																																																																																																																																																																																																																																																		
	Coobool Creek ♀	7	8.28	0.47	5.68	7.60	8.90							P ¹	Coobool Creek ♂	10	9.63	0.77	8.00	8.30	10.70	9.31	6	1.94	0.432	2.37	0.032	Coobool Creek ♀	7	8.81	0.55	6.24	7.90	9.60	P ²	Coobool Creek ♂	10	10.09	0.57	5.65	9.20	11.00	10.39	5	3.43	0.147	3.95	0.001	Coobool Creek ♀	7	9.14	0.31	3.39	8.60	9.50	M ¹	Coobool Creek ♂	8	12.88	0.38	2.95	12.10	13.30	14.39	1	1.01	1.000	6.31	0.000	Coobool Creek ♀	3	11.26	0.37	3.29	11.00	11.70	M ²	Coobool Creek ♂	11	12.46	0.47	3.77	11.80	13.20	7.88	8	2.01	0.326	3.32	0.005	Coobool Creek ♀	6	11.55	0.66	5.71	10.80	12.30	M ³	Coobool Creek ♂	12	10.20	0.73	7.16	10.20	12.70	-8.68	7	1.05	0.887	2.09	0.052	Coobool Creek ♀	7	11.17	0.75	6.71	9.70	11.70																																																																																																																																																																																																																									
P ¹	Coobool Creek ♂	10	9.63	0.77	8.00	8.30	10.70	9.31	6	1.94	0.432	2.37	0.032																																																																																																																																																																																																																																																																																																																																		
	Coobool Creek ♀	7	8.81	0.55	6.24	7.90	9.60							P ²	Coobool Creek ♂	10	10.09	0.57	5.65	9.20	11.00	10.39	5	3.43	0.147	3.95	0.001	Coobool Creek ♀	7	9.14	0.31	3.39	8.60	9.50	M ¹	Coobool Creek ♂	8	12.88	0.38	2.95	12.10	13.30	14.39	1	1.01	1.000	6.31	0.000	Coobool Creek ♀	3	11.26	0.37	3.29	11.00	11.70	M ²	Coobool Creek ♂	11	12.46	0.47	3.77	11.80	13.20	7.88	8	2.01	0.326	3.32	0.005	Coobool Creek ♀	6	11.55	0.66	5.71	10.80	12.30	M ³	Coobool Creek ♂	12	10.20	0.73	7.16	10.20	12.70	-8.68	7	1.05	0.887	2.09	0.052	Coobool Creek ♀	7	11.17	0.75	6.71	9.70	11.70																																																																																																																																																																																																																																														
P ²	Coobool Creek ♂	10	10.09	0.57	5.65	9.20	11.00	10.39	5	3.43	0.147	3.95	0.001																																																																																																																																																																																																																																																																																																																																		
	Coobool Creek ♀	7	9.14	0.31	3.39	8.60	9.50							M ¹	Coobool Creek ♂	8	12.88	0.38	2.95	12.10	13.30	14.39	1	1.01	1.000	6.31	0.000	Coobool Creek ♀	3	11.26	0.37	3.29	11.00	11.70	M ²	Coobool Creek ♂	11	12.46	0.47	3.77	11.80	13.20	7.88	8	2.01	0.326	3.32	0.005	Coobool Creek ♀	6	11.55	0.66	5.71	10.80	12.30	M ³	Coobool Creek ♂	12	10.20	0.73	7.16	10.20	12.70	-8.68	7	1.05	0.887	2.09	0.052	Coobool Creek ♀	7	11.17	0.75	6.71	9.70	11.70																																																																																																																																																																																																																																																																			
M ¹	Coobool Creek ♂	8	12.88	0.38	2.95	12.10	13.30	14.39	1	1.01	1.000	6.31	0.000																																																																																																																																																																																																																																																																																																																																		
	Coobool Creek ♀	3	11.26	0.37	3.29	11.00	11.70							M ²	Coobool Creek ♂	11	12.46	0.47	3.77	11.80	13.20	7.88	8	2.01	0.326	3.32	0.005	Coobool Creek ♀	6	11.55	0.66	5.71	10.80	12.30	M ³	Coobool Creek ♂	12	10.20	0.73	7.16	10.20	12.70	-8.68	7	1.05	0.887	2.09	0.052	Coobool Creek ♀	7	11.17	0.75	6.71	9.70	11.70																																																																																																																																																																																																																																																																																								
M ²	Coobool Creek ♂	11	12.46	0.47	3.77	11.80	13.20	7.88	8	2.01	0.326	3.32	0.005																																																																																																																																																																																																																																																																																																																																		
	Coobool Creek ♀	6	11.55	0.66	5.71	10.80	12.30							M ³	Coobool Creek ♂	12	10.20	0.73	7.16	10.20	12.70	-8.68	7	1.05	0.887	2.09	0.052	Coobool Creek ♀	7	11.17	0.75	6.71	9.70	11.70																																																																																																																																																																																																																																																																																																													
M ³	Coobool Creek ♂	12	10.20	0.73	7.16	10.20	12.70	-8.68	7	1.05	0.887	2.09	0.052																																																																																																																																																																																																																																																																																																																																		
	Coobool Creek ♀	7	11.17	0.75	6.71	9.70	11.70																																																																																																																																																																																																																																																																																																																																								

*T calculated using separate variance estimate

Table 77. Buccolingual crown dimensions of the maxillary and mandibular teeth in Murray Valley males and females (mm.)

MAXILLARY DENTITION																																																																																																																																																																																																																																																																																																																																															
		n	\bar{X}	s	CV	Min.	Max.	% Dimorphism	Rank	F	P	T	P																																																																																																																																																																																																																																																																																																																																		
I ¹	Murray Valley ♂	32	8.28	0.38	4.66	7.60	9.10	5.48	7	1.47	0.316	4.63	0.000																																																																																																																																																																																																																																																																																																																																		
	Murray Valley ♀	28	7.85	0.31	3.95	7.10	8.40							I ²	Murray Valley ♂	40	7.08	0.37	5.23	6.30	8.00	4.89	11	1.07	0.831	3.68	0.000	Murray Valley ♀	36	6.75	0.39	5.78	5.80	7.70	C	Murray Valley ♂	39	9.63	0.68	7.06	8.70	11.20	9.31	2	1.86	0.052	6.16*	0.000	Murray Valley ♀	42	8.81	0.49	5.56	7.70	10.00	P ¹	Murray Valley ♂	35	10.66	0.56	5.25	9.50	12.00	5.75	6	1.25	0.497	4.71	0.000	Murray Valley ♀	42	10.08	0.50	4.96	9.20	11.30	P ²	Murray Valley ♂	39	10.62	0.60	5.65	9.60	12.40	6.41	3	1.30	0.387	5.33	0.000	Murray Valley ♀	49	9.98	0.52	5.21	9.10	11.40	M ¹	Murray Valley ♂	28	13.17	0.68	5.16	11.40	14.70	3.95	15	1.77	0.095	3.48	0.001	Murray Valley ♀	43	12.67	0.51	4.03	11.80	13.90	M ²	Murray Valley ♂	37	13.83	0.71	5.13	12.30	15.70	5.28	9	1.36	0.319	5.08	0.000	Murray Valley ♀	49	13.10	0.61	4.66	12.80	14.60	M ³	Murray Valley ♂	37	13.08	0.86	6.57	11.40	16.30	6.17	4	1.29	0.412	4.28	0.000	Murray Valley ♀	46	12.32	0.75	6.09	10.80	14.10	MANDIBULAR DENTITION														I ¹	Murray Valley ♂	26	6.61	0.40	6.05	6.00	7.80	4.42	13	1.33	0.620	2.14	0.039	Murray Valley ♀	13	6.33	0.35	5.53	5.70	7.00	I ²	Murray Valley ♂	28	6.76	0.45	6.66	6.00	7.80	3.05	16	1.28	0.521	1.92	0.060	Murray Valley ♀	28	6.56	0.40	6.10	5.80	7.60	C	Murray Valley ♂	34	8.79	0.64	7.28	7.60	10.10	9.74	1	2.13	0.031	5.95	0.000	Murray Valley ♀	35	8.01	0.43	5.37	7.20	9.10	P ¹	Murray Valley ♂	35	9.17	0.46	5.02	8.50	10.40	5.16	10	1.48	0.248	3.76	0.000	Murray Valley ♀	38	8.72	0.56	6.42	7.60	9.60	P ²	Murray Valley ♂	32	9.18	0.58	6.32	8.10	10.60	3.96	14	1.01	0.982	2.60	0.011	Murray Valley ♀	34	8.83	0.59	6.68	7.30	10.00	M ¹	Murray Valley ♂	25	12.40	0.58	4.68	11.40	13.50	4.73	12	1.09	0.834	3.49	0.001	Murray Valley ♀	26	11.84	0.55	4.65	10.60	12.90	M ²	Murray Valley ♂	30	12.23	0.66	5.40	11.10	13.60	5.43	8	1.22	0.578	3.88	0.000	Murray Valley ♀	33	11.60	0.60	5.17	10.20	12.90	M ³	Murray Valley ♂	29	11.70	0.73	6.24	9.90	13.00	6.07	5	1.04	0.920	3.72	0.000
I ²	Murray Valley ♂	40	7.08	0.37	5.23	6.30	8.00	4.89	11	1.07	0.831	3.68	0.000																																																																																																																																																																																																																																																																																																																																		
	Murray Valley ♀	36	6.75	0.39	5.78	5.80	7.70							C	Murray Valley ♂	39	9.63	0.68	7.06	8.70	11.20	9.31	2	1.86	0.052	6.16*	0.000	Murray Valley ♀	42	8.81	0.49	5.56	7.70	10.00	P ¹	Murray Valley ♂	35	10.66	0.56	5.25	9.50	12.00	5.75	6	1.25	0.497	4.71	0.000	Murray Valley ♀	42	10.08	0.50	4.96	9.20	11.30	P ²	Murray Valley ♂	39	10.62	0.60	5.65	9.60	12.40	6.41	3	1.30	0.387	5.33	0.000	Murray Valley ♀	49	9.98	0.52	5.21	9.10	11.40	M ¹	Murray Valley ♂	28	13.17	0.68	5.16	11.40	14.70	3.95	15	1.77	0.095	3.48	0.001	Murray Valley ♀	43	12.67	0.51	4.03	11.80	13.90	M ²	Murray Valley ♂	37	13.83	0.71	5.13	12.30	15.70	5.28	9	1.36	0.319	5.08	0.000	Murray Valley ♀	49	13.10	0.61	4.66	12.80	14.60	M ³	Murray Valley ♂	37	13.08	0.86	6.57	11.40	16.30	6.17	4	1.29	0.412	4.28	0.000	Murray Valley ♀	46	12.32	0.75	6.09	10.80	14.10	MANDIBULAR DENTITION														I ¹	Murray Valley ♂	26	6.61	0.40	6.05	6.00	7.80	4.42	13	1.33	0.620	2.14	0.039	Murray Valley ♀	13	6.33	0.35	5.53	5.70	7.00	I ²	Murray Valley ♂	28	6.76	0.45	6.66	6.00	7.80	3.05	16	1.28	0.521	1.92	0.060	Murray Valley ♀	28	6.56	0.40	6.10	5.80	7.60	C	Murray Valley ♂	34	8.79	0.64	7.28	7.60	10.10	9.74	1	2.13	0.031	5.95	0.000	Murray Valley ♀	35	8.01	0.43	5.37	7.20	9.10	P ¹	Murray Valley ♂	35	9.17	0.46	5.02	8.50	10.40	5.16	10	1.48	0.248	3.76	0.000	Murray Valley ♀	38	8.72	0.56	6.42	7.60	9.60	P ²	Murray Valley ♂	32	9.18	0.58	6.32	8.10	10.60	3.96	14	1.01	0.982	2.60	0.011	Murray Valley ♀	34	8.83	0.59	6.68	7.30	10.00	M ¹	Murray Valley ♂	25	12.40	0.58	4.68	11.40	13.50	4.73	12	1.09	0.834	3.49	0.001	Murray Valley ♀	26	11.84	0.55	4.65	10.60	12.90	M ²	Murray Valley ♂	30	12.23	0.66	5.40	11.10	13.60	5.43	8	1.22	0.578	3.88	0.000	Murray Valley ♀	33	11.60	0.60	5.17	10.20	12.90	M ³	Murray Valley ♂	29	11.70	0.73	6.24	9.90	13.00	6.07	5	1.04	0.920	3.72	0.000	Murray Valley ♀	42	11.03	0.75	6.80	9.20	12.70														
C	Murray Valley ♂	39	9.63	0.68	7.06	8.70	11.20	9.31	2	1.86	0.052	6.16*	0.000																																																																																																																																																																																																																																																																																																																																		
	Murray Valley ♀	42	8.81	0.49	5.56	7.70	10.00							P ¹	Murray Valley ♂	35	10.66	0.56	5.25	9.50	12.00	5.75	6	1.25	0.497	4.71	0.000	Murray Valley ♀	42	10.08	0.50	4.96	9.20	11.30	P ²	Murray Valley ♂	39	10.62	0.60	5.65	9.60	12.40	6.41	3	1.30	0.387	5.33	0.000	Murray Valley ♀	49	9.98	0.52	5.21	9.10	11.40	M ¹	Murray Valley ♂	28	13.17	0.68	5.16	11.40	14.70	3.95	15	1.77	0.095	3.48	0.001	Murray Valley ♀	43	12.67	0.51	4.03	11.80	13.90	M ²	Murray Valley ♂	37	13.83	0.71	5.13	12.30	15.70	5.28	9	1.36	0.319	5.08	0.000	Murray Valley ♀	49	13.10	0.61	4.66	12.80	14.60	M ³	Murray Valley ♂	37	13.08	0.86	6.57	11.40	16.30	6.17	4	1.29	0.412	4.28	0.000	Murray Valley ♀	46	12.32	0.75	6.09	10.80	14.10	MANDIBULAR DENTITION														I ¹	Murray Valley ♂	26	6.61	0.40	6.05	6.00	7.80	4.42	13	1.33	0.620	2.14	0.039	Murray Valley ♀	13	6.33	0.35	5.53	5.70	7.00	I ²	Murray Valley ♂	28	6.76	0.45	6.66	6.00	7.80	3.05	16	1.28	0.521	1.92	0.060	Murray Valley ♀	28	6.56	0.40	6.10	5.80	7.60	C	Murray Valley ♂	34	8.79	0.64	7.28	7.60	10.10	9.74	1	2.13	0.031	5.95	0.000	Murray Valley ♀	35	8.01	0.43	5.37	7.20	9.10	P ¹	Murray Valley ♂	35	9.17	0.46	5.02	8.50	10.40	5.16	10	1.48	0.248	3.76	0.000	Murray Valley ♀	38	8.72	0.56	6.42	7.60	9.60	P ²	Murray Valley ♂	32	9.18	0.58	6.32	8.10	10.60	3.96	14	1.01	0.982	2.60	0.011	Murray Valley ♀	34	8.83	0.59	6.68	7.30	10.00	M ¹	Murray Valley ♂	25	12.40	0.58	4.68	11.40	13.50	4.73	12	1.09	0.834	3.49	0.001	Murray Valley ♀	26	11.84	0.55	4.65	10.60	12.90	M ²	Murray Valley ♂	30	12.23	0.66	5.40	11.10	13.60	5.43	8	1.22	0.578	3.88	0.000	Murray Valley ♀	33	11.60	0.60	5.17	10.20	12.90	M ³	Murray Valley ♂	29	11.70	0.73	6.24	9.90	13.00	6.07	5	1.04	0.920	3.72	0.000	Murray Valley ♀	42	11.03	0.75	6.80	9.20	12.70																																			
P ¹	Murray Valley ♂	35	10.66	0.56	5.25	9.50	12.00	5.75	6	1.25	0.497	4.71	0.000																																																																																																																																																																																																																																																																																																																																		
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	Murray Valley ♀	38	8.72	0.56	6.42	7.60	9.60							P ²	Murray Valley ♂	32	9.18	0.58	6.32	8.10	10.60	3.96	14	1.01	0.982	2.60	0.011	Murray Valley ♀	34	8.83	0.59	6.68	7.30	10.00	M ¹	Murray Valley ♂	25	12.40	0.58	4.68	11.40	13.50	4.73	12	1.09	0.834	3.49	0.001	Murray Valley ♀	26	11.84	0.55	4.65	10.60	12.90	M ²	Murray Valley ♂	30	12.23	0.66	5.40	11.10	13.60	5.43	8	1.22	0.578	3.88	0.000	Murray Valley ♀	33	11.60	0.60	5.17	10.20	12.90	M ³	Murray Valley ♂	29	11.70	0.73	6.24	9.90	13.00	6.07	5	1.04	0.920	3.72	0.000	Murray Valley ♀	42	11.03	0.75	6.80	9.20	12.70																																																																																																																																																																																																																																														
P ²	Murray Valley ♂	32	9.18	0.58	6.32	8.10	10.60	3.96	14	1.01	0.982	2.60	0.011																																																																																																																																																																																																																																																																																																																																		
	Murray Valley ♀	34	8.83	0.59	6.68	7.30	10.00							M ¹	Murray Valley ♂	25	12.40	0.58	4.68	11.40	13.50	4.73	12	1.09	0.834	3.49	0.001	Murray Valley ♀	26	11.84	0.55	4.65	10.60	12.90	M ²	Murray Valley ♂	30	12.23	0.66	5.40	11.10	13.60	5.43	8	1.22	0.578	3.88	0.000	Murray Valley ♀	33	11.60	0.60	5.17	10.20	12.90	M ³	Murray Valley ♂	29	11.70	0.73	6.24	9.90	13.00	6.07	5	1.04	0.920	3.72	0.000	Murray Valley ♀	42	11.03	0.75	6.80	9.20	12.70																																																																																																																																																																																																																																																																			
M ¹	Murray Valley ♂	25	12.40	0.58	4.68	11.40	13.50	4.73	12	1.09	0.834	3.49	0.001																																																																																																																																																																																																																																																																																																																																		
	Murray Valley ♀	26	11.84	0.55	4.65	10.60	12.90							M ²	Murray Valley ♂	30	12.23	0.66	5.40	11.10	13.60	5.43	8	1.22	0.578	3.88	0.000	Murray Valley ♀	33	11.60	0.60	5.17	10.20	12.90	M ³	Murray Valley ♂	29	11.70	0.73	6.24	9.90	13.00	6.07	5	1.04	0.920	3.72	0.000	Murray Valley ♀	42	11.03	0.75	6.80	9.20	12.70																																																																																																																																																																																																																																																																																								
M ²	Murray Valley ♂	30	12.23	0.66	5.40	11.10	13.60	5.43	8	1.22	0.578	3.88	0.000																																																																																																																																																																																																																																																																																																																																		
	Murray Valley ♀	33	11.60	0.60	5.17	10.20	12.90							M ³	Murray Valley ♂	29	11.70	0.73	6.24	9.90	13.00	6.07	5	1.04	0.920	3.72	0.000	Murray Valley ♀	42	11.03	0.75	6.80	9.20	12.70																																																																																																																																																																																																																																																																																																													
M ³	Murray Valley ♂	29	11.70	0.73	6.24	9.90	13.00	6.07	5	1.04	0.920	3.72	0.000																																																																																																																																																																																																																																																																																																																																		
	Murray Valley ♀	42	11.03	0.75	6.80	9.20	12.70																																																																																																																																																																																																																																																																																																																																								

*T calculated using separate variance estimate

Table 78. Buccolingual crown dimensions of the maxillary and mandibular teeth in the Swanport males and females (mm.)

		MAXILLARY DENTITION											
		n	\bar{X}	s	CV	Min.	Max.	% Dimorphism	Rank	F	P	T	P
I ¹	Swanport ♂	6	8.21	0.70	5.75	7.30	9.20	4.59	10	2.31	0.260	1.27	0.226
	Swanport ♀	10	7.85	0.46	5.86	7.30	8.70						
I ²	Swanport ♂	11	7.30	0.62	8.49	6.50	8.40	8.63	2	1.33	0.593	2.60	0.015
	Swanport ♀	17	6.72	0.54	8.04	5.80	7.80						
C	Swanport ♂	16	9.37	0.66	7.04	8.00	10.60	5.76	7	1.99	0.165	2.64	0.013
	Swanport ♀	19	8.86	0.47	5.30	8.00	9.70						
P ¹	Swanport ♂	15	10.64	0.74	7.79	9.50	12.10	6.08	6	2.34	0.115	2.68	0.012
	Swanport ♀	16	10.03	0.48	4.79	8.70	10.50						
P ²	Swanport ♂	19	10.35	0.92	8.89	8.70	12.30	5.61	9	3.67	0.005	2.42	0.020
	Swanport ♀	22	9.80	0.48	4.90	8.80	10.80						
M ¹	Swanport ♂	19	12.90	0.72	5.58	11.50	14.20	2.14	14	1.55	0.349	1.26	0.217
	Swanport ♀	20	12.63	0.58	4.59	11.90	14.10						
M ²	Swanport ♂	22	13.48	0.84	6.23	12.30	16.20	6.65	4	1.87	0.151	3.83	0.000
	Swanport ♀	23	12.64	0.61	4.83	11.70	14.00						
M ³	Swanport ♂	20	12.88	0.81	6.29	11.10	14.90	9.80	1	1.14	0.785	4.48	0.000
	Swanport ♀	18	11.73	0.76	6.48	10.20	13.00						
		MANDIBULAR DENTITION											
I ¹	Swanport ♂	6	6.55	0.50	7.63	6.00	7.20	5.65	8	2.70	0.300	1.44	0.181
	Swanport ♀	6	6.20	0.31	5.00	5.90	6.80						
I ²	Swanport ♂	9	6.61	0.45	6.81	5.80	7.20	2.16	13	2.53	0.274	0.71	0.492
	Swanport ♀	7	6.47	0.28	4.33	6.10	6.90						
C	Swanport ♂	11	8.39	0.62	7.39	7.10	9.30	4.22	11	2.84	0.091	1.64	0.116
	Swanport ♀	13	8.05	0.37	4.60	7.60	8.70						
P ¹	Swanport ♂	10	9.46	0.69	7.29	8.00	10.20	6.13	5	2.85	0.105	2.43	0.024
	Swanport ♀	12	8.88	0.40	4.50	8.10	9.40						
P ²	Swanport ♂	11	8.83	0.82	9.29	7.10	9.80	2.20	12	3.40	0.079	0.67	0.510
	Swanport ♀	10	8.64	0.44	5.09	7.90	9.20						
M ¹	Swanport ♂	11	12.19	0.68	5.58	11.00	13.60	1.58	15	1.68	0.391	0.77	0.451
	Swanport ♀	13	12.00	0.53	4.42	11.10	13.20						
M ²	Swanport ♂	13	11.78	0.82	6.96	10.50	13.50	1.20	16	2.03	0.206	0.55	0.590
	Swanport ♀	15	11.64	0.57	4.90	10.70	12.80						
M ³	Swanport ♂	12	11.90	1.07	8.99	10.40	13.90	7.99	3	1.77	0.340	2.32	0.030
	Swanport ♀	13	11.02	0.80	7.26	9.90	12.60						

Table 79. Buccolingual crown dimensions of the maxillary and mandibular teeth in Broadbeach males and females (mm.)

MAXILLARY DENTITION													
		n	\bar{X}	s	CV	Min.	Max.	% Dimorphism	Rank	F	P	T	P
I ¹	Broadbeach ♂	11	8.08	0.51	6.31	7.20	8.80	16.26	2	2.11	0.987	2.94	0.013
	Broadbeach ♀	2	6.95	0.35	5.04	6.70	7.20						
I ²	Broadbeach ♂	17	7.01	0.47	6.70	6.10	7.80	5.89	15	1.96	0.637	1.52	0.145
	Broadbeach ♀	4	6.62	0.34	5.14	6.20	6.90						
C	Broadbeach ♂	19	9.53	0.73	7.66	8.20	11.10	10.43	7	1.05	0.742	1.95	0.065
	Broadbeach ♀	3	8.63	0.75	8.69	8.10	9.50						
P ¹	Broadbeach ♂	19	10.61	0.64	6.03	9.40	11.80	12.28	4	9.32	0.506	2.48	0.023
	Broadbeach ♀	2	9.45	0.21	2.22	9.30	9.60						
P ²	Broadbeach ♂	16	10.63	0.70	6.59	9.60	11.50	11.31	5	1.70	0.424	2.01	0.061
	Broadbeach ♀	2	9.55	0.91	9.53	8.90	10.20						
M ¹	Broadbeach ♂	20	12.96	0.60	4.63	11.60	14.10	10.77	6	1.33	0.588	1.95	0.064
	Broadbeach ♀	4	11.70	0.69	5.90	11.70	13.30						
M ²	Broadbeach ♂	21	13.54	0.75	5.54	12.10	14.90	9.90	8	1.26	0.627	2.89	0.008
	Broadbeach ♀	4	12.32	0.85	6.90	11.20	13.20						
M ³	Broadbeach ♂	21	12.95	0.88	6.80	11.40	14.60	16.67	1	1.53	0.822	2.75	0.011
	Broadbeach ♀	4	11.10	0.71	6.40	11.10	12.70						
MANDIBULAR DENTITION													
I ¹	Broadbeach ♂	17	6.64	0.40	6.02	5.80	7.40	7.10	14	1.08	0.627	1.44	0.167
	Broadbeach ♀	2	6.20	0.42	6.77	5.90	6.50						
I ²	Broadbeach ♂	19	6.84	0.45	6.58	6.10	7.60	8.57	11	-	-	-	-
	Broadbeach ♀	1	6.30	-	-	6.30	6.30						
C	Broadbeach ♂	23	8.73	0.42	4.81	8.00	9.50	7.78	13	2.78	0.219	1.97	0.061
	Broadbeach ♀	2	8.10	0.70	8.64	7.60	8.60						
P ¹	Broadbeach ♂	23	9.27	0.50	5.39	8.20	10.20	13.60	3	2.55	0.202	3.35	0.003
	Broadbeach ♀	3	8.16	0.80	9.80	7.30	8.90						
P ²	Broadbeach ♂	19	9.45	0.60	6.35	8.30	10.40	9.88	9	1.98	0.333	2.16	0.043
	Broadbeach ♀	3	8.60	0.85	9.88	7.80	9.50						
M ¹	Broadbeach ♂	19	12.05	0.63	5.23	10.90	13.20	4.24	16	1.04	0.751	1.24	0.231
	Broadbeach ♀	3	11.56	0.64	5.54	11.10	12.30						
M ²	Broadbeach ♂	23	11.82	0.71	6.01	10.50	13.50	7.85	12	1.20	0.641	1.95	0.063
	Broadbeach ♀	3	10.96	0.77	7.03	10.10	11.60						
M ³	Broadbeach ♂	24	11.49	0.62	5.40	10.10	12.40	9.43	10	8.78	0.051	7.10*	0.000
	Broadbeach ♀	3	10.50	0.10	0.95	10.40	10.60						

*T calculated using separate variance estimate

Table 80.

Comparison of the buccolingual crown dimensions of permanent teeth from Coobool Creek male crania with those recorded for other Aboriginal male populations

MAXILLARY DENTITION

	I ¹			I ²			C			P ¹			P ²			M ¹			M ²			M ³		
	n	\bar{X}	s	n	\bar{X}	s	n	\bar{X}	s	n	\bar{X}	s	n	\bar{X}	s	n	\bar{X}	s	n	\bar{X}	s	n	\bar{X}	s
Coobool Creek	7	8.34	0.25	10	7.70	0.40	11	9.68	0.53	9	10.96	0.40	11	10.87	0.48	12	13.60	0.45	13	13.96	0.82	12	13.05	0.99
Murray Valley	32	8.28	0.38	40	7.08 [†]	0.37	39	9.63	0.68	35	10.66	0.56	39	10.62	0.60	28	13.17*	0.68	37	13.83	0.71	37	13.08	0.86
Kow Swamp ¹¹	2	8.30	0.14	2	7.60	0.14	2	9.00	0.57	2	10.10	0.71	2	10.20	0.57	2	13.55	0.35	2	13.95	0.21	3	13.37	0.06
Roonka	2	8.50	0.28	7	7.10*	0.46	7	9.28	0.21	7	10.71	0.25	7	10.85	0.49	5	13.00*	0.67	7	13.48	0.74	6	12.70	0.99
Swanport	6	8.21	0.70	11	7.30	0.62	16	9.37	0.66	15	10.64	0.74	19	10.35	0.92	19	12.90 [†]	0.72	22	13.48	0.84	20	12.88	0.81
Broadbeach	11	8.08	0.51	17	7.01 [†]	0.47	19	9.53	0.73	19	10.61	0.64	16	10.63	0.70	20	12.96 [†]	0.60	21	13.54	0.75	21	12.95	0.88
Yuendumu ²²	41	7.95	0.36	41	7.03 [†]	0.51	41	9.12*	0.56	85	10.38 [†]	0.61	85	10.29 [†]	0.56	85	12.63 [†]	0.54	41	12.83 [†]	0.73	32	12.09 [†]	0.82
Western Australia ³³	18	7.92	0.53	30	7.03 [†]	0.44	39	9.18*	0.56	42	10.32*	0.49	44	10.29 [†]	0.55	48	12.78 [†]	0.63	48	12.95 [†]	0.71	47	12.22*	0.82

MANDIBULAR DENTITION

	I ₁			I ₂			C			P ₁			P ₂			M ₁			M ₂			M ₃		
	n	\bar{X}	s	n	\bar{X}	s	n	\bar{X}	s	n	\bar{X}	s	n	\bar{X}	s	n	\bar{X}	s	n	\bar{X}	s	n	\bar{X}	s
Coobool Creek	3	7.03	0.11	7	7.02	0.49	9	9.21	0.47	10	9.63	0.77	10	10.09	0.57	8	12.88	0.38	11	12.46	0.47	12	11.90	0.73
Murray Valley	26	6.61	0.40	28	6.78	0.45	34	8.79	0.64	35	9.17*	0.46	32	9.18 [†]	0.58	25	12.40*	0.58	30	12.23	0.66	29	11.70	0.73
Kow Swamp ¹¹	1	6.00	-	1	6.80	-	2	8.60	0.00	2	9.45	0.49	3	9.23	0.45	-	-	-	1	12.50	-	2	11.95	0.64
Roonka	3	6.56 [†]	0.05	3	6.76	0.11	7	8.48 [†]	0.34	7	8.92*	0.33	7	9.12 [†]	0.64	4	12.30	0.57	6	11.75*	0.78	7	11.17*	0.73
Swanport	6	6.55	0.50	9	6.61	0.45	11	8.39 [†]	0.62	10	9.46	0.69	11	8.83 [†]	0.82	11	12.19*	0.68	13	11.78*	0.82	12	11.90	1.07
Broadbeach	17	6.64	0.40	19	6.84	0.45	23	8.73*	0.42	23	9.27	0.50	19	9.45*	0.60	19	12.05 [†]	0.63	23	11.82*	0.71	24	11.49	0.62
Yuendumu ²²	41	6.87	0.57	41	7.01	0.53	41	8.39 [†]	0.48	85	8.83 [†]	0.59	85	9.15 [†]	0.60	83	11.85 [†]	0.61	41	11.60 [†]	0.66	29	11.41	0.71
Western Australia ³³	12	6.65	0.60	19	6.69	0.48	24	8.67*	0.47	24	8.87 [†]	0.65	25	9.00 [†]	0.54	27	11.99 [†]	0.69	29	11.65 [†]	0.77	30	11.35	0.72

¹¹raw data from Thorne (1975:158-159) ²²Barrett *et al.* 1964 ³³Freedman and Lofgren 1981

* mean value exceeded by Coobool Creek mean, significant P=0.05-.01

† mean value exceeded by Coobool Creek mean, significant P=0.009-.001

Table 81.

Comparison of the buccolingual crown dimensions of permanent teeth in Coobool Creek female crania with those recorded for other Aboriginal female populations

MAXILLARY DENTITION																										
I ¹			I ²			C			P ¹			P ²			M ¹			M ²			M ³					
n	\bar{X}	s	n	\bar{X}	s	n	\bar{X}	s	n	\bar{X}	s	n	\bar{X}	s	n	\bar{X}	s	n	\bar{X}	s	n	\bar{X}	s	n	\bar{X}	s
5	8.02	0.46	6	7.35	0.40	6	9.10	0.48	6	10.31	0.34	6	10.28	0.75	5	13.08	0.72	6	13.00	0.78	6	12.43	1.43			
28	7.85	0.31	36	6.75 [†]	0.39	42	8.81	0.49	42	10.08	0.50	49	9.98	0.52	43	12.67	0.51	49	13.10	0.61	46	12.32	0.75			
10	7.85	0.46	17	6.72*	0.54	19	8.86	0.47	16	10.03	0.48	22	9.80	0.48	20	12.63	0.58	23	12.64	0.61	18	11.73	0.76			
2	6.95	0.35	4	6.62*	0.34	3	8.63	0.75	2	9.45*	0.21	2	9.55	0.91	4	12.30	0.69	4	12.32	0.85	4	11.65	0.71			
36	7.50	0.36	36	6.69 [†]	0.49	36	8.67	0.38	81	10.10	0.56	81	10.05	0.60	81	12.21*	0.57	36	12.42*	0.67	30	11.93	0.83			
13	7.44	0.44	19	6.67 [†]	0.50	24	8.44*	0.45	22	9.80*	0.66	23	9.70	0.68	25	12.07 [†]	0.52	26	12.21*	0.60	17	11.57*	0.62			

MANDIBULAR DENTITION																										
I ₁			I ₂			C			P ₁			P ₂			M ₁			M ₂			M ₃					
n	\bar{X}	s	n	\bar{X}	s	n	\bar{X}	s	n	\bar{X}	s	n	\bar{X}	s	n	\bar{X}	s	n	\bar{X}	s	n	\bar{X}	s	n	\bar{X}	s
4	6.35	0.70	4	6.72	0.54	7	8.28	0.47	7	8.81	0.55	7	9.14	0.31	3	11.26	0.37	6	11.55	0.66	7	11.17	0.75			
13	6.33	0.35	28	6.56	0.40	35	8.01	0.43	38	8.72	0.56	34	8.80	0.59	26	11.84	0.55	33	11.60	0.60	42	11.03	0.75			
6	6.20	0.31	7	6.47	0.28	13	8.05	0.37	12	8.88	0.40	10	8.64*	0.44	13	12.00 [∞]	0.53	15	11.64	0.57	13	11.02	0.80			
2	6.20	0.42	1	6.30	-	2	8.10	0.70	3	8.16	0.80	3	8.60	0.85	3	11.56	0.64	3	10.96	0.77	3	10.50	0.10			
36	6.44	0.32	36	6.63	0.40	36	8.03	0.38	81	8.69	0.55	81	8.94	0.51	80	11.44	0.51	36	11.29	0.42	30	11.16	0.57			
13	5.90	0.27	16	6.29	0.45	16	7.79*	0.42	19	8.47	0.50	16	8.81	0.52	15	11.35	0.73	15	11.20	0.69	17	10.95	0.93			

²²Freedman and Lofgren 1981 ¹¹Barrett *et al.* 1964

* mean value exceeded by Coobool Creek mean, significance P=.05-.01

† mean value exceeded by Coobool Creek mean, significance P=.009-.001

∞ mean value exceeds Coobool Creek mean, significance P=.05-.01

Summary

The Coobool Creek male dentitions, and to a lesser degree those of the Coobool Creek females, have greater mean buccolingual crown dimensions than the recent Australian Aboriginal series examined. Although the Coobool Creek dentitions have a mean size which is greater than the comparative samples, they exceed the maximum buccolingual crown dimensions recorded for these recent groups for only two teeth: the first and second mandibular premolars. The mandibular P2 is relatively molariform with a lingual expansion of the crown and prominent lingual cusps. The tooth breadth complex which clearly distinguishes the Coobool Creek sample from the comparative series is concentrated on the mandibles, which have significantly larger canines, first and second premolars and first and second molars than the comparative samples.

The Coobool Creek male means are significantly greater than the following male samples for the following teeth:

-Maxillary I2: Murray Valley, Roonka, Broadbeach, Yuendumu and Western Australia.

-Maxillary C, P1 and P2: Yuendumu and Western Australia.

-Maxillary M1: Murray Valley, Roonka, Swanport, Broadbeach, Yuendumu and Western Australia.

-Maxillary M2 and M3: Yuendumu and Western Australia.

-Mandibular I1: Roonka.

-Mandibular C and P1: Roonka, Swanport, Broadbeach, Yuendumu and Western Australia.

-Mandibular P2: Murray Valley, Roonka, Swanport, Broadbeach, Yuendumu and Western Australia.

-Mandibular M1: Murray Valley, Swanport, Broadbeach, Yuendumu and Western Australia.

-Mandibular M2: Roonka, Swanport, Broadbeach, Yuendumu and Western Australia.

-Mandibular M3: Roonka.

The Coobool Creek female sample is small for statistical purposes and few significant results were obtained in comparisons with the other female groups. The Coobool Creek female mean values for the buccolingual crown dimension are significantly greater than those recorded for the following comparative samples for the following teeth:

-Maxillary I2: Murray Valley, Swanport, Broadbeach, Yuendumu and Western Australia.

-Maxillary C: Western Australia.

-Maxillary P1: Broadbeach and Western Australia.

-Maxillary M1 and M2: Yuendumu and Western Australia.

-Maxillary M3: Western Australia.

-Mandibular C: Western Australia.

-Mandibular P2: Swanport.

5.5 Tooth breadth and cranial size associations

For the buccolingual crown dimension the Coobool Creek dentitions have larger mean values, for most teeth, than the recent Australian samples used in this analysis. However, the Coobool Creek series is also distinguished from these comparative populations by the larger mean size of their crania and mandibles. It is therefore possible that the large size of the Coobool Creek dentitions simply reflects an allometric association between tooth size and the size of the cranium.

The relationship between tooth size, cranial size, stature and body weight has received considerable attention in the anthropological and dental literature (Gabriel, 1955; Garn and Lewis, 1958; Filipsson and Goldson, 1963; Garn, *et al.*, 1968; Lavelle, 1974; Henderson and Corrucini, 1976; Anderson *et al.*, 1977; Lavelle, 1977; Gingerich, 1977; Wood, 1979). The original assumption appears to have been that 'in most cases, and especially

in Primates, large teeth necessitate large jaws, and large jaws a large body...' (Weidenreich, 1946:60).

Given that the fossil record of several Primate taxa consists almost exclusively of teeth, the allometric association between tooth size and body size/weight has been examined with the intention of constructing predictive models for the calculation of body size from tooth size (Gould, 1975; Kay, 1975; Gingerich, 1977; Wood, 1979). Although there is some evidence for an allometric association between molar crown areas and body size/weight for several Primate genera (Gingerich, 1977) there is little evidence for such a relationship in *Homo sapiens*.

Garn and Lewis (1958:878) using a modern European sample, found that 'with a mean r of -0.03 , the hypothesis that tooth-size and body-size are related receives very little support'. Similarly low correlations between stature (most often the length of the femur or humerus) and tooth size have been obtained by Filipssen and Goldson (1963), Garn, *et al.* (1968), Anderson, *et al.* (1975) and Anderson, *et al.* (1977). Low, but significant correlations between tooth size and body size were recorded by Henderson and Corrucini (1976) and moderate correlations (M1 $r=0.38-0.42$, M2 $r=0.29-0.32$, M3 $r=0.51-0.54$) between molar crown areas and femur length in a pooled-sex British sample (Lavelle, 1977). Using a sexed sample of South African Bantu skeletons, Wood (1979) found only low levels of correlation between tooth breadth and femur length, with a slightly negative allometric association between molar crown area and femur length. Higher correlations were obtained in the pooled sex samples as a result of a wide separation of the male and female means rather than any general pattern of covariance (1979: 193-194).

The association between tooth size and the size of the cranium has been examined by Filipssen and Goldson (1963), Lavelle (1974) and Wood (1979). Filipssen and Goldson (1963) recorded a low correlation ($r=0.20$) between incisor width and head width. Lavelle, using a pooled-sex sample, obtained low correlations (maximum $r=0.31$) between tooth breadth, cranial length and cranial breadth, with very few significant correlations. Low levels of correlation for tooth breadth and cranial length, in single-sex samples, were obtained by Wood (1979) (male \bar{X} $r=0.15$, female \bar{X} $r=0.18$, pooled \bar{X} $r=0.34$). Only three out of the 16 correlations in the single-sex samples were significant ($P=.05-.01$) and one of these was a significant negative correlation.

The relationship between the maxillary buccolingual crown dimensions and the size of the cranial vault, height of the facial skeleton and the size of the palate were examined in Australian Aboriginals using the Murray Valley sample. In Tables 82-84 tooth breadth is correlated with cranial breadth (maximum bi-parietal breadth), cranial length (glabella-opisthocranion), cranial height (basion-bregma), supraorbital breadth, nasion-prosthion, nasospinale-prosthion, alveolar length and alveolar breadth in the Murray Valley male, female and pooled samples. Due to the large number of missing teeth in the Murray Valley sample correlation matrices were calculated using the convention of pairwise deletion of missing data. This maximised the number of individuals included in each correlation. The alternative approach, listwise deletion, would have reduced the size of the pooled Murray Valley sample to 15.

Tooth breadth and vault size

In the Murray Valley male and female sample there are low levels of correlation between maximum bi-parietal breadth and the maxillary tooth breadths, with no significant correlations. The level of correlation is only slightly increased in the pooled sample, although five of the eight correlations are significant ($P=.020-.004$).

Cranial length (glabella-opisthocranion) is more highly correlated with tooth breadth in the male and pooled samples than is bi-parietal breadth. Three of the correlations in the male sample are significant ($P=.027-.002$), with the highest correlation ($r=.443$) between cranial length and canine breadth. Moderate correlations were obtained for each tooth in the pooled sample and these are all significant ($P=.001-.000$). The highest correlation is for canine breadth ($r=.584$) and the lowest for the lateral incisor and first molar ($r=.366-.377$).

Cranial height (basion-bregma) is only slightly correlated with tooth breadth in the male sample, with higher levels of correlation in the females. The male correlation for basion-bregma and the breadth of M3 ($P=.017$) and the female correlations for P2, M2 and M3 ($P=.007-.004$) are significant. There is an increased level of correlation in the pooled sample and although the correlations have only low to moderate values, they are all significant ($P=.012-.000$). The highest correlation ($r=.561$) is between the breadth of M3 and basion-bregma.

Supraorbital breadth gains only low levels of correlation with the maxillary tooth breadths in the single-sex samples. Only one correlation in the male (M2 $r=.359$ $P=.014$) and female (P2 $r=.232$ $P=.054$) samples are significant. Although there is an increased level of correlation in the

Correlations between maxillary buccolingual tooth dimensions and cranial size in male
Australian Aboriginal crania from the Murray River Valley

	I ¹	I ²	C	P ¹	P ²	M ¹	M ²	M ³
Max. Bi-parietal breadth	r .024	-.218	.103	.030	.203	.112	.254	.015
	n 31	39	38	34	38	27	37	37
	P .448	.091	.267	.433	.110	.289	.064	.465
Glabella-opisthocranion	r .262	.114	.443	.140	.248	.236	.399	.320
	n 32	40	39	35	39	28	37	37
	P .073	.242	.002	.210	.064	.113	.007	.027
Basion-bregma	r-.031	.058	.124	.136	.200	-.011	.072	.360
	n 30	38	37	33	37	26	35	35
	P .435	.364	.231	.224	.118	.477	.339	.017
Supraorbital breadth	r .143	.133	.150	-.100	.239	.145	.359	.160
	n 32	40	39	35	39	28	37	37
	P .217	.206	.181	.283	.071	.230	.014	.171
Nasion-prosthion	r .214	.222	.374	.152	.356	.203	.285	.222
	n 32	40	39	35	39	28	37	37
	P .119	.084	.009	.191	.013	.149	.043	.093
Nasospinale-prosthion	r .185	.342	.435	.139	.235	.071	.137	.284
	n 32	40	39	35	39	28	37	37
	P .154	.015	.003	.213	.075	.359	.208	.044
Alveolar length	r .305	.351	.347	.121	.424	.444	.656	.572
	n 32	40	39	35	39	28	37	37
	P .045	.013	.015	.244	.004	.009	.000	.000
Alveolar breadth	r .068	.351	.332	.313	.395	.312	.648	.420
	n 32	40	39	35	39	28	37	37
	P .355	.013	.019	.033	.006	.053	.000	.005

Table 83.

Correlations between maxillary buccolingual tooth dimensions and cranial size in female
Australian Aboriginal crania from the Murray River Valley

	I ¹	I ²	C	P ¹	P ²	M ¹	M ²	M ³
Max. Bi-parietal breadth	r .280	.187	.162	.153	.045	-.098	-.025	-.062
	n 26	35	40	40	47	41	47	44
	P .082	.141	.156	.172	.381	.269	.433	.344
Glabella-opisthocranion	r .267	.170	.159	.046	.178	.099	.186	.338
	n 28	35	41	41	48	42	48	46
	P .084	.164	.159	.386	.112	.266	.102	.011
Basion-bregma	r .126	.262	.146	.229	.358	.099	.359	.400
	n 26	34	39	39	46	41	46	43
	P .269	.067	.187	.080	.007	.268	.007	.004
Supraorbital breadth	r .193	.134	.189	-.072	.232	.129	.179	.145
	n 28	36	42	42	49	43	49	46
	P .162	.217	.115	.325	.054	.203	.109	.168
Nasion-prosthion	r-.009	-.015	.155	-.176	-.049	.194	.096	.173
	n 28	36	42	42	49	43	49	46
	P .481	.465	.163	.132	.369	.105	.255	.124
Nasospinale-prosthion	r .112	.182	.214	-.027	.056	.357	.242	.205
	n 28	36	42	42	49	43	49	46
	P .284	.144	.086	.433	.350	.009	.047	.085
Alveolar length	r .090	.418	.418	.302	.379	.425	.550	.373
	n 28	36	42	42	49	43	49	46
	P .324	.006	.003	.026	.004	.002	.000	.005
Alveolar breadth	r .094	.082	.243	-.119	.072	.280	.297	.288
	n 28	36	42	42	49	43	49	46
	P .316	.316	.060	.225	.312	.034	.019	.026

pooled sample, with seven of the eight correlations significant ($P=.012-.000$), the highest correlation is only $r=.372$ for M2.

Facial height and tooth breadth

Correlations between facial height (nasion-prosthion) and the maxillary tooth breadths obtain low to moderate values ($r=.152-.374$) in the male sample, with significant correlations for C, P2 and M2 ($P=.043-.009$). Correlation in the female sample is considerably lower than that in the male sample. There are four negative correlations and the maximum positive correlation is low ($r=.194$). As for the other variables, there is a higher level of correlation in the pooled sample, with a moderate correlation for canine breadth and nasion-prosthion ($r=.506$). All of the pooled correlations for tooth breadth and nasion-prosthion are significant ($P=.013-.000$).

Subnasal height (nasospinale-prosthion) shows low to moderate correlation with tooth breadth in the male sample, with the highest correlation for canine breadth ($r=.435$). Three of the male correlations are significant: I2, C and M3 ($P=.044-.003$). The female sample has slightly lower levels of correlation, with a maximum correlation of $r=.357$ for M1. Two of the female correlations are significant: M1 and M2 ($P=.047-.009$).

There is an increase in correlation in the pooled sample, with the smallest correlation for P1 ($r=.232$) and the largest for C ($r=.492$). All of the pooled correlations for the maxillary tooth breadths and nasospinale-prosthion are significant ($P=.021-.000$).

Tooth breadth and palate size

There is clearly a functional relationship between the maxillary tooth breadths and the length of the alveolar process. Moderate to high correlations predominate for these variables in both of the single-sex samples. Seven of the eight male correlations are significant ($P=.045-.000$), the one correlation that is not significant being that for P1 ($r=.121$ $P=.244$). The highest correlation in both the male ($r=.656$ $P=.000$) and female ($r=.550$ $P=.000$) samples is for M2. With the exception of the correlation for I1, all of the female correlations are significant ($P=.026-.000$).

The level of correlation is increased in the pooled sample where all of the correlations are significant ($P=.000$). These are the highest levels of correlation obtained in this analysis. The highest is between the breadth of M2 and alveolar length ($r=.706$ $P=.000$).

Although alveolar breadth obtains moderate to high levels of correlation with the maxillary tooth breadths in the male sample, there is a considerably lower level of correlation in the female series, with one negative correlation for P1 ($r= -.119$ $P=.225$). The maximum correlation in the male ($r=.648$ $P=.000$) and female ($r=.297$ $P=.019$) samples is between M2 breadth and alveolar breadth. All of the male correlations for alveolar breadth, with the exception of I1 ($r=.068$ $P=.355$), are significant ($P=.053-.000$). All of the correlations for the female molar teeth are significant ($P=.034-.026$). The pooled sample shows an increase in the level of correlation, with a maximum correlation of $r=.636$ for M2.

Discussion

Bi-variate plots for each set of correlates were examined. These plots indicated that for the correlations between the maxillary buccolingual

crown dimensions and cranial breadth (maximum bi-parietal breadth), cranial length (glabella-opisthocranion), cranial height (basion-bregma), supra-orbital breadth and facial height, there was little evidence of a biological relationship between the cranial and dental variables. The level of correlation in the single-sex samples is low and the increased correlation in the pooled sample owes more to the wide separation of the male and female means than to any overall pattern of covariance. These data support Wood's (1979) observations and indicate that there is little evidence of an allometric association between tooth breadth and the size of the vault in *Homo sapiens*.

The mean correlations for the maxillary tooth breadths and the four cranial vault dimensions (bi-parietal breadth, glabella-opisthocranion, basion-bregma and supraorbital breadth) in the male, female and pooled samples are as follows:

Murray Valley males

I ¹	I ²	C	P ¹	P ²	M ¹	M ²	M ³
.115	.130	.205	.101	.222	.126	.271	.213

Murray Valley females

I ¹	I ²	C	P ¹	P ²	M ¹	M ²	M ³
.216	.188	.164	.125	.203	.106	.186	.236

Pooled Murray Valley

I ¹	I ²	C	P ¹	P ²	M ¹	M ²	M ³
.378	.275	.406	.310	.407	.260	.392	.378

The mean correlations demonstrate that no one tooth consistently gains higher correlations with the cranial dimensions than does any other tooth. In the male sample the largest mean correlation is for M1, with the smallest for P1. In the female sample the largest mean correlation is M3 with the smallest for M1. Two teeth, P2 and C, obtain similarly large correlations

in the pooled sample, with the smallest correlation obtained by M1.

In contrast to these data, there is strong support for a functional relationship between the breadth of the maxillary teeth and the length of the alveolar process. Measurements of alveolar length cover the anatomical region supporting the teeth. To some extent measurements of alveolar length are also measures of tooth size and reflect the topographical relationship between these variables. However, there is also a large biological relationship in the high levels of correlation between these variables. Large teeth need a correspondingly large area of alveolar bone to provide adequate developmental space for the tooth, and when the tooth reaches occlusion, to provide support for the tooth roots and sufficient space for the correct occlusion of the crown. Alveolar breadth, while displaying a reasonably linear relationship with tooth breadth, obtained a considerably reduced level of correlation in the female sample, relative to that in the males. The first and second molars consistently displayed higher levels of correlation with alveolar breadth and length than did the other teeth.

Weidenreich (1946:60) argued that in Primates large teeth necessitate large jaws. The Australian Aboriginal data for male and female crania from the Murray River Valley support this broad view. However, there is little support for a strong allometric relationship between tooth breadth and the size of the cranial vault. Predictions of the size of the cranium from the buccolingual crown dimensions of the maxillary teeth, at least in Australian Aboriginals, would be valueless.

5.6 The Pleistocene background to Australian tooth size

The Coobool Creek dentitions can be distinguished from those in both recent and prehistoric Australian populations by the greater mean breadths of the maxillary and mandibular teeth and the suggestion of greater sexual dimorphism.

Significant features of the Coobool Creek dentitions are: 1. the large mean size of the maxillary lateral incisors, which in size and morphology are closer to the medial incisors than are the lateral incisors in recent Australian populations; 2. a large and robust maxillary first molar; 3. great breadth in the mandibular canines, premolars and first and second molars; 4. the Coobool Creek second premolars are distinctly molariform, with a lingual extension of the crown and prominent lingual cusps; 5. the maximum buccolingual crown dimensions of the mandibular first and second premolars exceed the comparative Australian range.

Analysis of the association between tooth size and the size of the vault in the Murray Valley sample indicates that there is no allometric association between tooth breadth and vault size. Extremely low levels of correlation were obtained in the single-sex samples, with an increased level of correlation in the pooled sample, resulting from the distance between the male and female means rather than high covariance. No one tooth displayed consistently high levels of correlation with the cranial variables.

Given the low correlation between tooth breadth and vault size in Australian Aborigines, the great tooth breadths in the Coobool Creek sample are unlikely to be a product of tooth and vault size allometry. Although it is possible that allometry may account for a slight overall increase in

tooth size, it would not produce areas of specific increase, such as Coobool Creek maxillary lateral incisors or mandibular second premolars.

Townsend and Brown's (1978b) examination of tooth size heritability in Australian Aborigines from Yuendumu concluded that additive genetic variance accounted for about 64 percent of total phenotypic variability, common environment contributed about 6 percent, and within-family environment the remaining 30 percent (1978a:501). Environmental effects may be either prenatal or postnatal in origin (Holloway, *et al.*, 1961; Bailit and Sung, 1968; Keene, 1971; Townsend and Brown, 1978a, 1978b). Tooth calcification is influenced by environmental factors, such as the intake of fluoride or molybdenum, and this has a subsequent influence on crown size and morphology (Kruger, 1962; Goose and Roberts, 1979). For example, high fluoride levels in drinking water is probably a factor in the relatively microdont condition of the Australian Aborigines from Yuendumu (Williamson and Barrett, 1972; Brown and Townsend, 1980).

Although the prenatal and postnatal environment of an individual may influence the morphology and size of the teeth, there is no reason to suspect that it results in the pattern of increased tooth size evident in the Coobool Creek series. Areas of specific tooth size increase in this series appear to be indicative of a phyletic relationship rather than environmental effects. Given the arguments presented by Klaatsch (1908), Weidenreich (1946), Macintosh and Larnach (1972) and, most recently by Thorne and Welpoff (1981) for a morphological continuum linking the Indonesian *Homo erectus* specimens and Australian Aborigines, the Coobool Creek tooth breadths were compared with the *H. erectus* material from Sangiran and Choukoutien (Tables 85 and 86).

Table 85.

Comparison of the maxillary buccolingual crown dimension for Coobool Creek males with those recorded for *Homo erectus* from Sangiran and Choukoutien (mm.)

		n	\bar{X}	s	CV	Min.	Max.
I ¹	Coobool Creek	7	8.34	0.25	3.00	8.00	8.70
	Choukoutien	5	7.76**	0.31	3.99	7.50	8.10
	Sangiran	2	7.85	0.07	0.89	7.70	8.00
I ²	Coobool Creek	10	7.70	0.40	5.19	6.90	8.40
	Choukoutien	3	8.10*	0.10	1.23	8.00	8.20
	Sangiran	2	7.25	0.07	0.97	7.20	7.30
C	Coobool Creek	11	9.68	0.53	5.48	8.70	10.60
	Choukoutien	6	10.22	0.44	4.31	9.80	10.80
	Sangiran	9	10.34	1.43	13.83	8.80	12.00
P ¹	Coobool Creek	9	10.96	0.40	4.38	10.60	11.80
	Choukoutien	6	11.70*	0.86	7.35	10.50	12.80
	Sangiran	6	11.68	1.43	12.24	9.90	13.80
P ²	Coobool Creek	11	10.87	0.48	4.42	10.20	11.70
	Choukoutien	8	11.48*	0.67	5.84	10.30	12.50
	Sangiran	5	11.42	1.27	11.12	10.20	13.30
M ¹	Coobool Creek	12	13.60	0.45	3.31	12.80	14.10
	Choukoutien	8	12.56**	0.63	5.02	11.70	13.50
	Sangiran	5	13.16	0.81	6.16	12.40	14.40
M ²	Coobool Creek	13	13.96	0.82	5.87	12.70	15.30
	Choukoutien	6	13.05**	0.78	5.98	12.10	14.10
	Sangiran	7	13.99	1.28	9.15	12.50	15.40
M ³	Coobool Creek	12	13.05	0.99	7.59	10.80	14.40
	Choukoutien	9	11.82**	1.23	10.41	10.40	14.60
	Sangiran	7	13.61	0.85	6.25	12.30	14.80

*Significantly greater than Coobool Creek \bar{X} , P=.05-.01

**Significantly less than Coobool Creek \bar{X} , P=.05-.01

Table 86.

Comparison of the mandibular buccolingual crown dimensions for Coobool Creek males with those recorded for *Homo erectus* from Sangiran and Choukoutien (mm.)

		n	\bar{X}	s	CV	Min.	Max.
I ₁	Coobool Creek	3	7.03	0.11	1.56	6.90	7.10
	Choukoutien	7	6.49	0.43	6.63	5.80	7.10
	Sangiran	1	6.90	-	-	6.90	6.90
I ₂	Coobool Creek	7	7.02	0.49	6.98	6.40	7.60
	Choukoutien	7	7.10	0.34	4.79	6.60	7.60
	Sangiran	4	7.55	0.19	2.52	7.40	7.80
C	Coobool Creek	9	9.21	0.47	5.10	8.20	9.80
	Choukoutien	6	9.00	0.72	8.00	8.20	10.10
	Sangiran	5	9.44	0.90	9.53	8.30	10.70
P ₁	Coobool Creek	10	9.63	0.77	8.00	8.30	10.70
	Choukoutien	14	9.76	0.86	8.81	8.20	10.80
	Sangiran	3	11.00	0.79	7.18	10.40	11.90
P ₂	Coobool Creek	10	10.09	0.57	5.65	9.20	11.00
	Choukoutien	8	10.28	1.20	11.67	8.60	12.00
	Sangiran	4	10.93*	0.25	2.29	10.60	11.20
M ₁	Coobool Creek	8	12.88	0.38	2.95	12.10	13.30
	Choukoutien	17	11.74**	0.79	6.73	10.10	13.00
	Sangiran	9	12.53	0.92	7.34	11.70	14.20
M ₂	Coobool Creek	11	12.46	0.47	3.77	11.80	13.20
	Choukoutien	9	12.13	0.78	6.43	10.80	13.10
	Sangiran	7	13.29*	0.68	5.12	12.50	14.50
M ₃	Coobool Creek	12	11.90	0.73	7.16	10.20	12.70
	Choukoutien	7	11.14**	1.07	9.61	10.20	13.10
	Sangiran	8	12.69*	1.19	9.38	11.10	14.70

*Significantly greater than Coobool Creek \bar{X} , P=.05-.01

**Significantly less than Coobool Creek \bar{X} , P=.05-.01

One feature immediately distinguishing the *H. erectus* samples from the Coobool Creek males is the greater variance in the Asian samples. Two factors which probably contribute to the high degree of variation in the *H. erectus* samples are temporal variation and sexual dimorphism. The Djetis (Putjangan) beds at Sangiran have been variously estimated as having a basal date in the late Pliocene or early Pleistocene. The overlying Kabuh formation has potassium-argon dates on pumice from the middle of the deposit dated to 781,000 to 908,000 years and on tektites 710,000 years BP (Jacob, 1972, 1976). As the Sangiran deposits may cover a period of a million years some temporal variation is to be expected. Comparison of the tooth breadths from the Djetis and Kabuh deposits suggests temporal reduction in the breadths of the cheek teeth (P1-M3). The Lower Cave deposits from Choukoutien have been dated, using a faunal sequence, to between 500,000 and 400,000 years BP (Chia, 1975). The observable differences in the dental dimensions of the two *H. erectus* samples, most importantly the reduction in the size of the molar teeth at Choukoutien relative to Sangiran, has been interpreted as evidence of regional evolutionary change (Wolpoff, 1980).

The tooth size complex in the *H. erectus* specimens from Sangiran and Choukoutien is distinct from that recorded for Australian Aboriginal populations, including Coobool Creek and Kow Swamp. However, in the breadths of the mandibular teeth, especially the relative breadths of P1 and P2, and in the relative breadths of the maxillary I1 and I2, the Coobool Creek series occupies an intermediate position between the Asian *H. erectus* material and recent Australian populations.

In the maxillary dentition both *H. erectus* populations can be distinguished from Coobool Creek by the great mean breadths of their canines and first and second premolars. This is most evident in the Sangiran sample, where the maximum breadths of P1 (13.8mm) and P2 (13.3mm) are approximately 15 percent greater than the maximum breadths at Coobool Creek (P1 11.8mm, P2 11.7mm). The Coobool Creek maxillary molars are significantly larger ($P=.05-.01$) than those in the Choukoutien sample. In both these samples the relative breadths of the molar series proceeds $M2>M1>M3$, while at Sangiran the progression is $M2>M3>M1$. The Sangiran molar sequence has a bilateral incidence of 11 percent in the pooled Murray Valley sample. This molar sequence is present bilaterally in Coobool crania CC36, CC46 and CC71 and unilaterally in CC28. The maxillary molar sequence is preserved in only two of the Kow Swamp crania (KS1 and KS15) both of these have the modern pattern ($M2>M1>M3$). There are no significant differences in breadth between the maxillary molars at Coobool Creek and Sangiran.

The maxillary medial and lateral incisor samples for both *H. erectus* populations are unfortunately small, but are sufficient to suggest that the lateral incisors were broad relative to the medial incisors. In the Coobool Creek and Sangiran sample the relationship of medial incisor breadth to lateral incisor breadth is 1.08:1. In Australian populations, other than Coobool Creek, the relatively reduced size of the lateral incisor results in a coefficient of 1.12-1.19:1. In the small Choukoutien sample, where mean lateral incisor breadth actually exceeds medial incisor breadth, this relationship is 1:1.04. The medial and lateral incisors are preserved in four of the Kow Swamp crania (KS1, KS2, KS15 and KS16), in all but the last of these individuals there is a relative expansion of the maxillary lateral incisors.

Parallels between the tooth breadths at Coobool Creek and those from Sangiran and Choukoutien are most apparent in the mandibular dentition. There are five significant differences between the mean mandibular tooth breadths in the Coobool Creek and Asian samples. Two of these (M1 and M2) result from greater mean breadths in the Coobool Creek sample relative to Choukoutien ($P=.05-.01$). Compared to Coobool Creek the Sangiran sample has significantly greater breadth for the mandibular P2, M2 and M3 ($P=.05-.01$).

The Coobool Creek and Choukoutien samples have a similar breadth relationship of the mandibular premolars, with molarisation and lingual expansion of the crown in P2 relative to P1. The small Sangiran sample suggests that this population exhibited greater mean breadth for P1 than Choukoutien. Relative to both the Coobool Creek and Sangiran samples the Choukoutien mandibular molars show a marked reduction in breadth. However, both *H. erectus* samples preserve the archaic molar size sequence $M2>M1>M3$ while the Coobool Creek males have the modern sequence $M1>M2>M3$ and the Coobool Creek females the archaic sequence $M2>M1>M3$. The breadth of the M2 exceeds M1 in Coobool Creek CC12 and M2 equals M1 in CC71. In the recent Australian Aboriginal series from the Murray River Valley the bilateral incidence of the *H. erectus* molar sequence is eight percent. In both of the Kow Swamp mandibles in which M1 and M2 are preserved (KS1 and KS15), M1 is broader than M2.

SECTION 6

CONCLUSION

6.1 The Coobool Creek and Kow Swamp morphological pattern

Morphological, univariate and multivariate comparisons of the crania, mandibles and dentitions from Coobool Creek and Kow Swamp have distinguished these samples from recent Australian populations (Thorne and Macumber, 1972; Thorne, 1975; Pietrusewsky, 1979; Brace, 1980; Brown, 1981b) and what has been interpreted as a morphologically more gracile group of Pleistocene crania: Mungo 1, Mungo 3 and Keilor (Thorne and Wilson, 1977; Thorne, 1977). The anatomical features distinguishing the Coobool Creek and Kow Swamp series reflect the combined effects of an archaic morphological pattern (Thorne and Wolpoff, 1981) and a shared cultural practice, artificial cranial deformation (Brothwell, 1975; Brown, 1981b).

The Coobool Creek and Kow Swamp mandibles can be clearly distinguished, morphologically and statistically, from the recent and other prehistoric comparative samples used in this analysis. They combine great corpus height, both at the symphysis and between the first and second molars, with great corpus thickness. The rami are tall and broad with robust, elongated coronoid processes and massive condyles. The masseteric fossae are large and deep, with marked eversion of the angles, especially in males. On the medial surface of the corpus the mylohyoid ridge passes in a low, smooth curve downwards to the submaxillary fossae and inferior border, rather than dropping away abruptly below the mylohyoid line. The maximum dimensions for symphyseal height, corpus height, corpus thickness,

bigonial breadth and bicondylar breadth exceed the maxima recorded for other Australian samples of any age.

One of the major distinguishing features of the crania from Coobool Creek and Kow Swamp is their great size. Of the 64 variables in the Coobool Creek and Murray Valley male comparison, 50 have mean values which are significantly greater ($P=.05-.000$) in the Coobool Creek sample. Similar results were obtained in comparisons with the male and female crania from Swanport and Broadbeach.

It is from a lateral aspect that several of the crania from Coobool Creek and Kow Swamp appear particularly distinctive. These crania combine marked recession of the frontal squama with great cranial height, a relatively great anterior-posterior curvature of the parietal bones and a flattened occipital bone. These features in association with several others are indicative of artificial deformation. Morphological and statistical comparisons suggest that the area least likely to be influenced by the deformation process is the orofacial skeleton. Detailed comparisons of temporal and regional variation, involving the Coobool Creek and Kow Swamp crania, should therefore be restricted to this general anatomical region.

The Coobool Creek crania are markedly dolichocephalic, with broadly flaring zygomatic arches creating large temporal fossae. The frontal bones are large, with great supraorbital and postorbital breadths. The glabella region is low and broad, with relatively slight depression at nasion. The zygomatic trigones are often globose and thickened, exceeding the development in the comparative Australian samples.

The facial skeletons are large and robust. The nasal bones are broad and flattened, exhibiting great breadth at the nasofrontal articulation. Absolutely shallow orbits are placed above massive, robust zygomatic bones. The zygomatic bones combine a maximum depth which exceeds the comparative Australian range with prominent malar tuberosities, a thickened inferior border and a column-like frontal process.

Inferiorly the subnasal region is dominated by the large size of the incisor and canine roots. The subnasal area is elongated and prognathic, with a relatively straight alignment of the incisor and canine roots. The canine eminences are extremely prominent. Maximum alveolar breadth in the Coobool Creek palates expands the recorded Australian range.

Other features distinguishing the Coobool Creek and Kow Swamp crania include a tendency for maximum cranial breadth to be located towards the cranial base, rather than on the parietal bones. There is great mean thickness in the bones of the cranial vault, although some crania (CC1 and CC66) are at the opposite end of the Australian range for this feature. The glenoid fossae are deep with prominent articular eminences.

The Coobool Creek dentitions are distinguished from the comparative recent and other prehistoric Australian samples by their greater mean buccolingual crown dimensions. The mean breadths of the Coobool Creek maxillary lateral incisors and first molars and of the mandibular canines, first and second premolars and first and second molars are significantly greater than the comparative Australian samples. The most distinctive teeth in the Coobool Creek sample are the large and robust maxillary lateral incisors and the molariform mandibular second premolars. Although there are few teeth preserved from Kow Swamp, the available data supports the Coobool Creek results.

In summary the Coobool Creek and Kow Swamp individuals share a similar morphological pattern in their crania, mandibles and dentitions. This suite of features distinguishes them from recent and other prehistoric skeletal samples from the Murray Valley region.

6.2 An initial chronology for the Coobool Creek remains

At the present time there are no radiometric dates, either on bone or calcium carbonate crust, directly related to the Coobool Creek skeletal material. Bone and calcium carbonate samples have been submitted for analysis but the results are not complete. Therefore assessments of the possible age of the Coobool Creek sample rest purely on comparative cranial morphology and/or cultural evidence.

Morphological dating involves a comparison of specimens from a site without firm chronological control with specimens from a sequence of known age. Morphological dating has been misused, as early estimations of the age of the Talgai cranium demonstrate (Smith, 1914). However, 'morphological evolution did occur, and on average, samples from different times can be distinguished from one another' (Wolpoff, 1980:12).

There is considerable interpopulation and intrapopulation variation in Aboriginal cranial morphology (Pietrusewsky, 1979), variation which has been interpreted to indicate either a single (Abbie, 1960), dihybrid (Topinard, 1872; Freedman and Lofgren, 1979b; Thorne, 1980) or trihybrid (Birdsell, 1967) origin for the Australian Aboriginal. Due to the possibly extreme morphology of individuals, attempts at morphological dating involving isolated specimens may prove difficult to assess. Comparisons between populations are more likely to provide meaningful results and the larger the samples the greater the expected resolution. In this respect

the relatively large size of the Coobool Creek sample makes it well suited for morphological dating. It is possible to compare the Coobool Creek crania with the dated skeletal series from Kow Swamp (Thorne, 1975), Roonka (Pretty, 1977; Prokopec, 1979) and Broadbeach (Haglund, 1976; Freedman and Wood, 1977) and the Murray Valley sample excavated by Blackwood and Simpson (1973).

Although there is an ethnographic account of cranial deformation from northern Victoria (Kenyon, 1928:165), there is no evidence of the morphological pattern associated with deformation in the 'recent' crania from Victoria, South Australia and New South Wales that I have examined. There is also no evidence of cranial deformation in the prehistoric samples from Roonka (7,000 years BP - contact period) (Pretty, 1977; Prokopec, 1979), the Murray River Valley (6,000 - 750 years BP) (Blackwood and Simpson, 1973) and Broadbeach (1,300 years BP - contact period) (Haglund, 1976; Freedman and Wood, 1977). Therefore, the presence of artificial cranial deformation in the Coobool Creek and Kow Swamp series is a strong indicator of similar general age for these two groups, and possibly of a single cultural association between them, particularly as they are from the same geographical area. The Kow Swamp crania are bracketed by dates of $13,000 \pm 280$ (ANU-1236) and $9,300 \pm 220$ (ANU-619b) years BP (Thorne, 1975). This argues for a similar age for Coobool Creek in the terminal Pleistocene.

On the available evidence from the Murray Valley region the Coobool Creek sample is older than Roonka grave 89 dated to $6,910 \pm 450$ years BP (ANU-1408) (Pretty, 1977:297) and the Wentworth crania excavated by Blackwood and Simpson (1973:105) dated to $5,900 \pm 550$ years BP (GaK-1430). The crania excavated from these two sites, Roonka and Wentworth, are morphologically

indistinguishable from recent Aboriginal crania from the same area. Pietrusewsky's (1979) multivariate comparison of Australian Aboriginal crania places the Roonka series with recent populations from the same geographical area. The morphological and cultural affiliations of the Coobool Creek series are clearly with the Kow Swamp population, which is dated to between 13,000 and 9,000 years BP.

6.3 Temporal change within the Murray River Valley

In their multivariate statistical comparison of the Kow Swamp crania with a 'recent' Victorian series Thorne and Wilson (1977) found that the major distinguishing features were located in the fronto-facial region. They argue that this indicates that major morphological changes have occurred in the facial and frontal regions of Aboriginal crania from northern Victoria over the last 10,000 years.

The Coobool Creek data both extend and modify their argument. The evidence for cranial deformation in the Coobool Creek and Kow Swamp samples indicates that temporal changes in frontal bone morphology are of cultural origin (Brown, 1981b). However, the additional data available for the facial skeleton, mandible and dentition from Coobool Creek add considerable support to their thesis.

Temporal change over the last 10,000 years in the central Murray River valley is indicated by a comparison of the Coobool Creek series with the 'recent' Murray Valley sample. During this period there is an overall reduction in the size of the orofacial skeleton and dentition. There is a marked reduction in facial height and supraorbital breadth. The zygomatic bones become shallower, with a thinning of the inferior border and a less robust frontal process. In association with the reduced size of the

incisor and canine roots, the subnasal region becomes shallower and less prognathic. Mean palate size decreases, although the reduction is more evident for alveolar breadth than length. The breadth of the interorbital region decreases and there is an apparent increase in the height of the orbits. The nasal root becomes increasingly depressed and the glabellae take on a more inflated, prominent appearance. There is a general reduction in tooth size and in the supportive alveolar bone, and the lower face becomes less robust.

In the mandible there is a marked reduction in the height and thickness of the corpus and in bigonial and bicondylar breadth. The mental trigone becomes more prominent and there is an increasing frequency of positive chins. On the medial surface of the corpus, the mylohyoid ridge becomes more sharply defined, with a prominent elongated mylohyoid line. The areas of attachment for the masseters and pterygoids become less rugose and depressed. The rami decrease in height and there is a proportional increase in the breadth of the rami relative to their height.

There is a reduction in the mean buccolingual crown dimension of the male maxillary dentition of (2.37 percent) and mandibular dentition (4.62 percent), with an overall reduction of 3.50 percent. The two teeth which display the greatest size reduction are the maxillary lateral incisors (8.75 percent) and mandibular second premolars (9.91 percent). This reduction in tooth size is not as evident in comparisons between the female samples from Coobool Creek and the Murray Valley. In females there is a reduction in the maxillary dentition of 2.87 percent and mandibular dentition 0.86 percent, with an overall reduction of 1.86 percent. The tooth which shows by far the greatest degree of reduction in the female sample are the maxillary lateral incisors (8.88 percent).

Outside Australia similar changes in the size and morphology of the orofacial complex and dentition over the last 20,000 to 10,000 years have been recorded for sub-Saharan Africa (Rightmire, 1974, 1975), Nubia (Van Gerven *et al.*, 1973; Carlson and Van Gerven, 1977), the Mediterranean (Le Blanc and Black, 1974), Europe (Brace, 1967; Brace and Mahler, 1971; Brose and Wolpoff, 1971; Frayer, 1977) and Asia (Brace, 1978). However, there is considerable debate covering the mechanism involved, especially in relation to the reduction of tooth size in the European Paleolithic and Mesolithic. A major issue, as with most instances of temporal change in human anatomy, is whether this is a product of internal adaptation and evolution or whether the changes simply reflect gene pool alteration through migration (Howells, 1976b).

The argument which has been pursued with the greatest vigour sees the overall trend towards reducing tooth size as a response to the relaxation of selection pressure for large teeth (Brace, 1963, 1964; Wolpoff, 1969; Brace and Mahler, 1971). In particular it is increasing pre-masticatory preparation of food resulting from technological change, and decreasing use of the teeth in functions unrelated to mastication (as tools), which are seen as the major causal agents. According to this model the rate at which the dentition reduces in size can be expected to increase with the introduction of agriculture and soft, refined carbohydrate staples.

Although there is an inverse relationship between tooth size and technology, at least for Europe over the last 20,000 years (Brace, 1967; Bordes, 1968; Brose and Wolpoff, 1971; David, 1973), this in itself does not demonstrate a causal relationship.

Brace (1963) proposed that structural reduction in the facial skeleton and dentition through the European Paleolithic and Neolithic was a result of the 'probable mutation effect'. This hypothesis refers to the accumulation of recessive genes which result from the relaxation of selection pressure for a structure or configuration of structures. Brace argues that the accumulation of these recessive genes results in structural reduction. Criticisms of Brace's hypothesis (Prout, 1964; Wright, 1964; Brues, 1966; Holloway, 1966; Bailit and Friedlander, 1966; Suarez, 1974) have pointed out that while the accumulation of random mutations could be expected to result from a relaxation of selection, with a subsequent increase in morphological variation (Guthrie, 1965), there is no reason why this should result in directional structural reduction.

Structural reduction is a particularly controversial area in evolutionary genetics and several competing hypotheses have been proposed. Wright (1964:66) in reply to Brace (1964) argued that structural reduction is 'due largely to selection for pleiotropic effects of newly favoured alleles of the genes that had been involved in the development of the organ in question...the substitution of new alleles would on average tend to bring about reduction of the organ after its maintenance had ceased to be an object of natural selection.'

Others have proposed a developmental interaction, involving dental field theory and allometric relationships between decreasing size in the facial skeleton and the developmental areas of the teeth (Sofaer *et al.*, 1971; Anderson *et al.*, 1975; Gould, 1975), or a straightforward allometric relationship between tooth size and body size (Pilbeam and Gould, 1974; Wolpoff, 1973).

An interesting argument has been presented by Prout (1964), who suggests that a nonfunctioning structure still requires a great expenditure of metabolic energy to create and maintain, and hence will be selected against. This theory assumes that an organism expending energy for an unnecessary structure will be at a selective disadvantage.

Decisive experimental support is lacking for each explanation of structural reduction, although the interaction between developmental fields and the orofacial skeleton appears to be the most promising (Sofaer, 1973). All the theoretical approaches to structural reduction envisage the process as a result of the relaxation of selection. For the human dentition it is a reduction in the selective factors for large tooth size. In this respect the trend towards structural reduction in the size of the dental complex in the Murray River Valley over the last 10,000 years is of importance. In Europe reduction in tooth size has been accompanied by marked cultural changes from the Paleolithic to the Neolithic, with the development of agriculture and sedentary life styles (Brose and Wolpoff, 1971). Australia during the same period of time is distinguished by relative cultural conservatism. Although there have been changes in stone tool technology (White and O'Connell, 1979), there is no evidence of either major changes in diet or food preparation technology in the Murray River area such that the selection pressure for large, thick-enameled teeth would be reduced. Indeed one of the most distinctive features of the dentitions in recent Aboriginal populations from the Murray Valley is marked dental attrition. Pulp exposure and abscess development as a result of acute attrition are normal for recent adult Aboriginal dentitions from this area. Selection must have favoured large, slow-wearing teeth, at least at the European contact period for which we have detailed

descriptions of diet and the nonmasticatory uses of the teeth (Kreffft, 1866; Beveridge, 1883; Curr, 1883). I find it difficult to believe that there has been any relaxation in the selection pressure for large teeth in this region over the last 10,000 years.

It is possible that change within the Murray Valley, rather than reflecting internal processes of selection and adaptation, indicates gene flow into this area from regions with smaller mean tooth size. Analyses of Australian Aboriginal tooth size (Townsend and Brown, 1979 ; Brace, 1980; Freedman and Lofgren, 1981; Smith *et al.*, 1981) indicate that there is considerable intrapopulation variation in tooth size within the continent. Areas of maximum tooth size are centred on the central Murray River Valley. Tooth size is at a minimum in samples from northern, central and western Australia. Brace (1980) argues for the presence of tooth size clines, primarily running north-south, but possible sampling bias resulting from the pooling of the male and female individuals compromises these results. Data from Townsend and Brown (1979), Freedman and Lofgren (1981) and Smith *et al.* (1981), while highlighting the variation within Australia, is insufficient to demonstrate the presence of a clinal distribution for tooth size. A greater amount of sexed regional data are needed, especially since Townsend and Brown (1978b) have demonstrated that there is a larger environmental component in tooth size than was previously suspected.

The Roonka dental statistics provide an interesting comparison with those data from Coobool Creek. There is no evidence of the Coobool Creek tooth size pattern in the Roonka material from 7,000 to 5,000 years BP, which does not have the relative expansion of the maxillary lateral incisors and mandibular second premolars. The pattern of mean tooth

breadths for the Roonka male sample is similar to that in the recent populations from Swanport and the Murray Valley. This suggests that there may have been a relatively rapid reduction in tooth size over the period 10,000 to 6,000 years BP, followed by apparent stability. There is presently no evidence to indicate that this reduction in the size of the dental complex continued after 6,000 years BP. Environmental and cultural determinants of tooth size apparently remained constant in the Murray Valley during this period, with no evidence of gene flow from areas exhibiting smaller mean tooth size.

The older skeletal materials from this general region, the Mungo 1 female dated to 24,500 to 26,500 years BP (Bowler *et al.*, 1972; Thorne, 1975) and the Mungo 3 male dated to 28,000 to 30,000 years BP (Bowler and Thorne, 1976; Thorne, 1977), have poorly preserved facial skeletons and dentitions. Although these two specimens are towards the gracile end of the Australian range, they fall within the range of variation of the Coobool Creek series. Two of the Coobool Creek crania (female CC1 and male CC66) are morphologically gracile, with a thin cranial vault and relatively delicate facial skeleton. However, both of these Coobool Creek crania have the morphological pattern associated with artificial deformation and so direct statistical comparisons with the Mungo specimens is not possible. There is currently insufficient evidence to indicate the tooth size pattern of the Lake Mungo population. Thorne (1975, 1976, 1977) has reviewed the status of the Mungo remains and as no additional skeletal material has been described from this area in recent years I am unable to add to these statements.

6.4 The mark of ancient Java ?

It was Klaatsch (1908:163) who first drew attention to the morphological similarities between some recent Australian Aboriginal crania and the then recently discovered *Pithecanthropus erectus* cranium from Java. More recently the argument for a morphological continuum linking the Australian and Indonesian material has been supported by Weidenreich (1946:83) who suggested a 'continuous line of evolution' linking the Indonesian and Australian crania, Macintosh and Larnach (1972), Thorne and Macumber (1972) and Thorne and Wolpoff (1981). Macintosh and Larnach (1972:4) concluded on the basis of their morphological comparison that 'there is little or no doubt that the *Homo erectus* traits show greater persistence in Australian Aboriginal crania than in any other racial group...'

In their description of the Kow Swamp crania Thorne and Macumber (1972) draw attention to morphological parallels with the Indonesian *Homo erectus* crania. Particular emphasis is placed on the size and morphology of the fronto-facial skeleton, especially the marked recession of the frontal squama in KS1 and KS5, and the thickness of the bones of the cranial vault. Thorne and Wolpoff (1981) enlarge upon these earlier statements and present the first detailed argument for a regional morphological clade containing the Sangiran *Homo erectus* material, in particular Sangiran 17, and the terminal Pleistocene crania from Kow Swamp. However, it should be stressed that in drawing attention to this regional clade, they emphasise that there are important changes in grade distinguishing the two series.

Features which Thorne and Wolpoff (1981) find best express this clade relationship are seen in the facial skeleton although other features are supportive: the flatness of the frontal in the sagittal plane, the

posterior position of the maximum frontal breadth, the relatively horizontal orientation of the inferior supraorbital border, the presence of a distinct prebregmatic eminence and the low position of maximum parietal breadth. I have argued (Brown, 1981b) that the morphology and size of the cranial vault in several of the crania from Coobool Creek and Kow Swamp have been influenced by cranial deformation. In particular the marked recession of the frontal squama, the presence of a prebregmatic eminence and cranial breadth have been influenced by deformation in these specimens. Unfortunately this restricts comparisons of the Australian and Indonesian material to the orofacial skeleton, mandible and dentition. However, the diagnostic features of these anatomical regions appear to support the argument for a regional morphological clade.

There are a number of features which I assess as being both morphologically archaic, and indicating a morphological continuum with the Indonesian *Homo erectus* material. The zygomatic bone is deep and robust with a thickened inferior border, prominent malar tuberosity and robust frontal process. The faces possess great supraorbital breadth and facial height. Maximum facial height and the height of the subnasal region exceed that recorded for recent and other prehistoric Australian populations. There is a relatively straight alignment of the maxillary incisor roots. Alveolar breadth exceeds the previously recorded Australian range and there is a tendency for maximum alveolar breadth to be located posterior to the second molars. Great interorbital breadth is associated with a broad frontonasal articulation. The mean thickness of the bones in the cranial vault in the Coobool Creek series is significantly greater than that in recent Australian populations.

The mandibles are extremely large and robust with maximum corpus height (at the symphysis and posteriorly at the level of M2), corpus thickness, bigonial breadth and bicondylar breadth exceeding the maxima in recent, and other prehistoric, Australian populations. The lateral prominence is typically well developed and the mylohyoid ridge passes in a smooth curve, downwards to the inferior border. The mandibular condyles are extremely large and robust.

The significant feature of the Coobool Creek dentitions is the great mean size, in particular the size of the maxillary lateral incisor and mandibular second premolar. The maxillary lateral incisors approach the medial incisors in size and the mandibular second premolars are distinctly molariform.

Initial dating estimates place the Coobool Creek series with the Kow Swamp material, in the terminal Pleistocene and/or early Holocene. The Coobool Creek material both extends and refines the morphological pattern described by Thorne (1975) for Kow Swamp. There is evidence of temporal change in the size and morphology of the orofacial skeleton, mandible and dentition in the Murray River Valley in the period 10,000 to 6,000 years BP and on the limited evidence available this was followed by morphological and metrical stability. It is unlikely on present evidence that the observable structural reduction in the orofacial skeleton and dentition is related to a relaxation in the selection pressures for a large and robust masticatory complex. Only new hominid materials, both from Australia and further to the north, will provide a solution.

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